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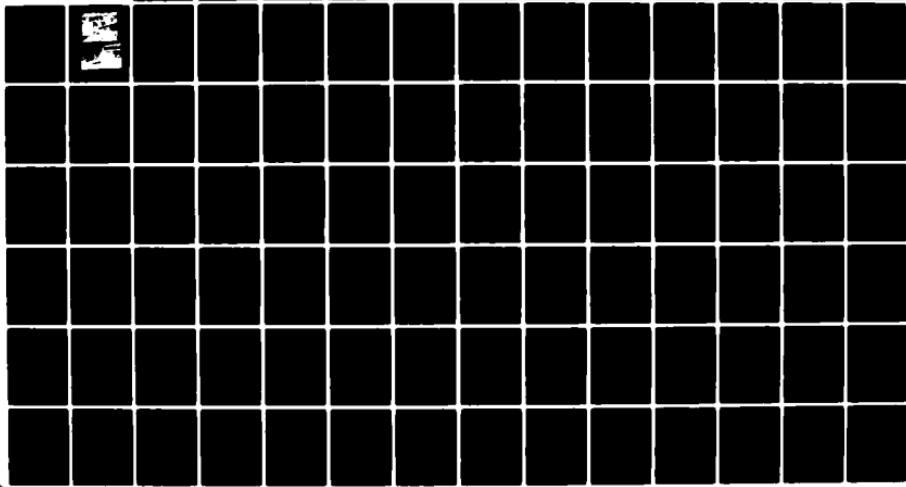
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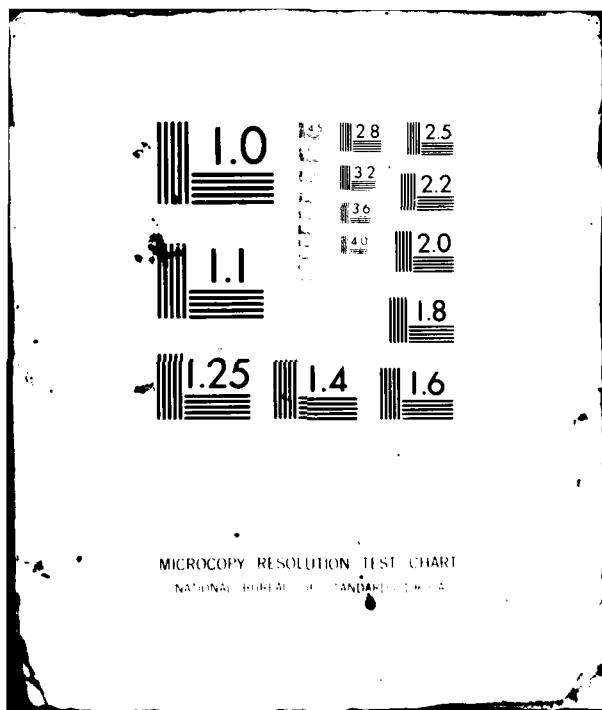
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LEVEL II

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**BY THE COMPTROLLER GENERAL
Report To The Honorable James R. Sasser
United States Senate
OF THE UNITED STATES**

**Better Targeting Of Federal Funds
Needed To Eliminate Unsafe Bridges**

ADA109569

The Federal Highway Administration estimates that it would cost \$41.1 billion to replace or rehabilitate the more than 200,000 deficient bridges in the Nation. The Federal bridge program--currently funded at slightly more than \$1 billion per year--helps States and local governments to finance replacement or rehabilitation of these bridges by providing up to 80 percent of project costs.

GAO found that the program is not as effective as it could be because of its broad criteria for funding eligibility--those bridges most in need of attention are not always selected. GAO also found that States and local governments are not fully complying with the National Bridge Inspection Standards.

The Secretary of Transportation should direct the Federal Highway Administration to revise the eligibility criteria, concentrate on bridges most in need of replacement or rehabilitation, and still provide flexibility for the States and local governments. The Secretary should also direct the Federal Highway Administration to assess and develop a strategy for bringing about full compliance with inspection standards. GAO also makes several recommendations to the Congress to further improve these programs.

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON D.C. 20548

B-201433

The Honorable James R. Sasser
United States Senate

Dear Senator Sasser:

In answer to your request, this report discusses the Nation's bridge problem and summarizes the results of our review of the National Bridge Inspection and Highway Bridge Replacement and Rehabilitation Programs. At your request we obtained oral comments from the Federal Highway Administration and did not obtain comments from any other agency. The Federal Highway Administration's comments are summarized in the report.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 5 days from the date of the report. At that time we will send copies to the Secretaries of Transportation, Agriculture, the Army, Defense, and the Interior; the Chairman, Tennessee Valley Authority; and the Director, Office of Management and Budget. We will also make copies available to the House Committee on Public Works and Transportation, the Senate Committee on Environment and Public Works, and other congressional committees and interested parties.

Sincerely yours,

Milton J. Dorolar

Acting Comptroller General
of the United States

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COMPTROLLER GENERAL'S
REPORT TO THE HONORABLE
JAMES R. SASSER
UNITED STATES SENATE

BETTER TARGETING OF FEDERAL
FUNDS NEEDED TO ELIMINATE
UNSAFE BRIDGES

D I G E S T

The United States has more than 500,000 bridges, and slightly over 200,000--or almost 4 out of every 10 bridges--are deficient. The Federal Highway Administration currently estimates that it will cost \$41.1 billion to rehabilitate or replace these bridges. (See p. 9.)

National bridge inventory data shows that about 98,000 bridges are structurally weak or unsound and must be closed, restricted to lighter vehicles, or immediately rehabilitated to prevent further deterioration and collapse. The other 102,000 deficient bridges are functionally obsolete because they are narrow, have inadequate underclearances, have insufficient load-carrying capacity, or are poorly aligned with the roadway and can no longer safely service today's traffic. In total, it is reported that about 120,000 bridges are or should be posted for lower weight limits; over 3,700 bridges are reported as closed to all traffic. (See pp. 5, 11, and 25.)

The December 1967 collapse of the Silver Bridge over the Ohio River between West Virginia and Ohio killed 46 people and focused national attention on bridge conditions. Shortly thereafter, the Congress established two major bridge safety programs: a program of periodic inspections to identify bridge conditions, maintenance needs, and safety problems and a program to provide Federal funds to the States specifically to help replace unsafe bridges. (See p. 1.)

GAO reviewed these programs at the request of Senator James Sasser of Tennessee and found that limited Federal bridge program funds are not always used on bridges most in need of attention. GAO also found that Federal agencies, States, and local governments are not fully complying with national standards for bridge inspection.

BETTER TARGETING OF FEDERAL
BRIDGE FUNDS NEEDED

The Federal Government has become the major source of funds--particularly through the Federal bridge program--to replace or rehabilitate deficient bridges, and many State and local governments depend heavily on these funds. (See p. 25.) Bridge program funding authorizations have totaled \$5 billion from the program's beginning in fiscal year 1972 through fiscal year 1982. Authorizations averaged about \$120 million per year for the program's first 7 years and slightly over \$1 billion for the last 4 years. (See p. 18.) Initially limited to bridges on the Federal-aid highway system, subsequent legislation in November 1978 expanded the programs to also include bridges off the Federal-aid system. (See p. 1.)

Under the bridge program, the Federal Government contributes up to 80 percent of replacement or rehabilitation costs, and State and/or local governments provide the rest. Some bridges are being replaced or rehabilitated under other Federal-aid programs and some are being replaced or rehabilitated solely with State and local funds. However, at current funding levels, it will take years to eliminate the deficient bridges already identified. Additional bridges will need replacing during this period, and continued inflation at the current rate would more than double the cost in 10 years. (See pp. 4 and 25.)

In view of the size of the bridge problem and the limited amount of funds available, it is essential that program funds be used for bridges most in need. However, GAO found that

- the Federal Highway Administration's project eligibility criteria do not concentrate on bridges in the worst condition and most in need;
- many worthy projects are funded, but bridges most in need are not always selected; and
- funds have been apportioned to the States based on incomplete and outdated needs data.

Most of the program funds are apportioned to the States. However, \$200 million annually are to be used as discretionary funds by the Secretary of

Transportation for bridges whose replacement or rehabilitation cost would be greater than \$10 million or twice the respective States' fiscal year authorizations. (See pp. 4 and 26.) The Federal Highway Administration selects the bridges for discretionary funding (subject to final approval by the Secretary of Transportation). The States select the bridges to be replaced or rehabilitated with the regular bridge program funds. (See pp. 41 and 42.)

Each bridge receives a sufficiency rating, which is the method used to evaluate the adequacy of a bridge to remain in service in its present condition. A rating of 100 would represent an entirely sufficient bridge--one that needs absolutely no work. A 0 rating would indicate an entirely insufficient or deficient bridge--one that has many safety problems and should be closed. The lower the rating, the higher the priority for replacement. (See pp. 6 and 42.)

The Federal Highway Administration's eligibility criteria are broad. The definition of a deficient bridge includes a wide variety of bridge inadequacies and conditions. Under the criteria, deficient bridges with sufficiency ratings of 80 or below on a scale of 0 to 100 are eligible. Those with ratings below 50 can be replaced or rehabilitated. Those with ratings of 50 through 80 generally can be rehabilitated only. (See pp. 42 and 60.)

The States are selecting many bridges with low sufficiency ratings for Federal funding. In the 10 States that GAO examined project approval data, about 40 percent of the bridges selected for funding had ratings below 20. However, the States also are selecting some bridges with relatively high ratings. For the 10 States, 534, or about 21 percent, of the 2,544 bridges selected had ratings of 40 or above and many of these had ratings of 60 or above. (See p. 50.)

Federal Highway officials said that they encourage the States to select bridges with lower sufficiency ratings, but the States may select any eligible bridge and many factors, some unique to an individual State, enter into the selection process. (See p. 53.)

The Federal Highway Administration is selecting bridges for discretionary funding with relatively high sufficiency ratings when other eligible

bridges have much lower ratings and are in much worse condition. The major reason is that bridges with legislative history are selected first. The Federal Highway Administration considers bridges to have legislative history if they are mentioned in congressional committee reports or the Congressional Record as candidates for discretionary funding. More and more bridges are receiving legislative history. (See pp. 41 and 59.)

Apportionments to the States have not been based on complete and current needs data which is available. For example, fiscal year 1982 apportionments will be based on 1978 data that does not include many bridges that are eligible for the program, such as those off the Federal-aid system. (See pp. 27 and 36.)

RECOMMENDATIONS

GAO is recommending that the Secretary of Transportation direct the Administrator of the Federal Highway Administration to:

- Revise the bridge program's project eligibility criteria to concentrate on bridges in the worst condition and most in need of replacement or rehabilitation but still provide some flexibility for State and local governments.
- Develop a formal selection process for discretionary projects to properly weigh factors such as sufficiency ratings, costs, and benefits. (See p. 61.)

GAO is also recommending that the Congress, in future bridge program authorizations, have the Secretary of Transportation use the latest available needs data, including bridge needs off the Federal-aid system, to apportion program funds. (See p. 37.)

See pp. 37 and 38 for additional recommendations.

BETTER COMPLIANCE WITH NATIONAL BRIDGE INSPECTION STANDARDS NEEDED

The major aspect of the National Bridge Inspection Program is that State and/or local governments maintain a bridge inventory and comply with the inspection standards. (See pp. 1, 3, and 87.)

GAO found that State and local governments have made progress since the program's start, but they are not fully complying with the standards. For example:

- Some inspectors do not meet the minimum qualifications for training and experience.
- Some State and local governments are not inspecting their bridges at least every 2 years as required by the standards, and some local governments are not inspecting their bridges at all.
- The initial inventory and inspection of bridges, particularly bridges off the Federal-aid highway system, has not been completed. (See p. 83.)
- Structurally weak bridges are not always being properly closed or posted for lower weight limits to protect against bridge collapses. Even if bridges are properly posted or closed, the postings and closings are often ignored by the public. Bridge weight limit enforcement is limited, and fines for violations are small and ineffective. (See p. 97.)

Federal agencies, such as the Bureau of Land Management, the Forest Service, and the National Park Service, own about 14,000 bridges. These agencies are not required to comply with the National Bridge Inspection Standards for most of their bridges, but they do have inspection programs. However, the agencies were not always complying with their own requirements, and some of the programs did not conform to the national standards. GAO believes that the public should be able to expect the same degree of safety when traveling in national parks and on other Federal lands as the standards provide for on State and local government bridges. (See pp. 100 and 105.)

RECOMMENDATIONS

GAO is recommending that the Secretary of Transportation direct the Administrator of the Federal Highway Administration to assess the States' and local governments' compliance with the National Bridge Inspection Standards and develop a strategy for bringing about full compliance. (See pp. 83 and 97.)

GAO is also recommending that the Congress require Federal agencies that own bridges to comply with the National Bridge Inspection Standards. (See p. 106.)

Other recommendations are noted on pages 84 and 98.

AGENCY COMMENTS AND GAO's EVALUATION

To expedite report issuance, Senator Sasser directed GAO to obtain only Federal Highway Administration's oral comments. Its officials told GAO that their comments do not necessarily represent those of the Secretary of Transportation.

Federal Highway Administration officials generally agreed with GAO's recommendation to use the latest needs data to allocate Federal bridge funds. The officials said that they will continue to encourage the States to select bridges in the lower range of sufficiency ratings. However, they also said that State and local officials need flexibility when selecting projects, and factors other than the sufficiency rating must be considered.

GAO also believes that selecting officials need flexibility. However, the bridges most in need of immediate attention are not always being selected. The bridge program, which is currently funded at slightly over \$1 billion per year, cannot effectively be directed at all deficient bridges, which the Federal Highway Administration estimates would cost \$41.1 billion.

Federal Highway Administration officials said that they have established an implementation plan and factors such as sufficiency ratings, costs, and benefits have been and will continue to be considered when selecting discretionary projects. They stated, however, that the program has received much congressional direction through the legislative history process.

The 1978 Surface Transportation Assistance Act gives the Secretary of Transportation broad discretion to select projects for discretionary funding. In GAO's opinion, it is the Secretary's responsibility to select the most worthy projects, and the current selection method does not ensure that this is done. (See pp. 38, 61, and 62.)

Federal Highway Administration officials did not indicate agreement or disagreement with GAO's recommendation concerning State and local government compliance with the National Bridge Inspection Standards. The officials commented on the items that GAO said should be considered during development of a strategy for bringing about full compliance. (See pp. 84, 85, and 98.)

Federal Highway Administration officials' comments on GAO's other recommendations are contained in the body of this report. (See pp. 38, 39, 40, 85, 86, 99, and 106.)

Contents

	<u>Page</u>
DIGEST	i
CHAPTER	
1 INTRODUCTION	1
Bridge safety legislation	1
Program administration and responsibilities	5
Objectives, scope, and methodology	6
2 THE BRIDGE PROBLEM AND EFFORTS TO SOLVE IT	9
The bridge problem	9
Efforts to replace or rehabilitate deficient bridges	18
The bridge situation in selected States	21
Conclusions	24
3 METHODS FOR DISTRIBUTING FEDERAL BRIDGE FUNDS COULD BE IMPROVED	26
Better distribution of funds to the States could make the program more effective	26
Distribution of funds within the States	30
Conclusions	36
Recommendations to the Congress	37
Recommendations to the Secretary of Transportation	38
FHWA comments and our evaluation	38
4 FEDERAL BRIDGE PROGRAM FUNDS SHOULD BE LIMITED TO BRIDGES MOST IN NEED OF REPLACEMENT OR REHABILITATION	41
Prioritizing and project selection responsibilities are divided	41
FHWA's project eligibility criteria are loose	42
Project selection by the States	47
Better project selection method needed for discretionary funds	54
Conclusions	60
Recommendations	61
FHWA comments and our evaluation	61
5 GREATER EFFORTS ARE NEEDED TO OBTAIN COMPLIANCE WITH THE NATIONAL BRIDGE INSPECTION STANDARDS	63
Better compliance with the National Bridge Inspection Standards is still needed	63

<u>CHAPTER</u>		<u>Page</u>
	Inconsistency in bridge inspection ratings is a major concern	76
	Monitoring of the bridge inspection program should be improved	81
	Conclusions	83
	Recommendations	83
	FHWA comments and our evaluation	84
6	BRIDGE POSTING AND CLOSING: MORE NEEDS TO BE DONE TO PROTECT THE MOTORING PUBLIC	87
	Bridge posting and closing requirements and responsibilities	87
	Bridges are not being promptly and properly posted and closed	89
	Bridge postings and closings are often ignored, and enforcement is limited	93
	Conclusions	96
	Recommendations	97
	FHWA comments and our evaluation	98
7	FEDERAL AGENCIES THAT OWN BRIDGES SHOULD COMPLY WITH THE NATIONAL BRIDGE INSPECTION STANDARDS	100
	Number and condition of Federal agency bridges	100
	Federal agency bridge inspection programs	103
	The national bridge inventory and Federal agency bridges	104
	Conclusions	105
	Recommendation	106
	FHWA comments and our evaluation	106
APPENDIX		
I	Letters dated April 4 and 16, 1980, from Senator Jim Sasser	107
II	FHWA's definition of a deficient bridge	110
III	Sufficiency ratings given 10 bridges by State inspection officials in the same State and in different States	112
IV	Classification of bridge structure based on ratings assigned by State inspection officials and FHWA's definition of a deficient bridge	113

ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
FHWA	Federal Highway Administration
GAO	General Accounting Office
TRIP	The Road Information Program

CHAPTER 1

INTRODUCTION

The United States has a substantial bridge problem. According to the Federal Highway Administration (FHWA), there are more than 500,000 bridges nationwide, and many are old and have passed or are approaching the end of their expected life. The threat to safety, inconvenience, and the financial burden of the approximately 200,000 deteriorated and obsolete bridges have become a national concern. Over time, many older bridges have been weakened by weather, erosion, vibration, decay, metal fatigue, and other factors. Increasing amounts of traffic and heavier vehicles have hastened their deterioration. Many bridges have become functionally obsolete as traffic has increased and roadways have been widened and improved but the bridges have not. In many cases, not enough funds have been available to improve bridges, which are usually the most costly part of the highway and are designed for longer life. Additionally, some bridges have design, construction, or material flaws.

The December 1967 collapse of the Silver Bridge between West Virginia and Ohio killed 46 people and focused the Nation's attention on bridge conditions. As a result, the Congress established two major bridge safety programs: a program of periodic inspections to identify bridge conditions, maintenance needs, and safety problems and a program of providing Federal funds to the States to help replace unsafe bridges. The programs initially were limited to bridges on the Federal-aid highway system, but November 1978 legislation included bridges off the Federal-aid system (off-system bridges).

BRIDGE SAFETY LEGISLATION

The Federal-Aid Highway Act of 1968 (Public Law 90-495, sec. 26, 82 Stat. 815) established the National Bridge Inspection Program. The act required the Secretary of Transportation, in consultation with State highway departments and other interested and knowledgeable parties, to establish standards for inspecting Federal-aid bridges. The standards were to specify methods for the State highway departments to use in conducting safety inspections, minimum time lapse between inspections, and the qualifications of those responsible for carrying out the inspections. The act further required each State to maintain written inspection reports and a current inventory of all Federal-aid bridges. The States ^{1/} were authorized to use Federal-aid highway administration and planning funds for training, inventory, and inspection. The act also required the Secretary of Transportation to establish a training program for Federal and State employees.

^{1/}The term "States" in this report refers to the 50 States, the District of Columbia, and Puerto Rico.



THE SILVER BRIDGE AFTER ITS COLLAPSE IN DECEMBER 1967.

PHOTOGRAPHS COURTESY OF THE FEDERAL HIGHWAY ADMINISTRATION

The National Bridge Inspection Standards were developed and published in the Federal Register effective May 27, 1971. The standards--which are now contained in title 23, part 650 of the Code of Federal Regulations--required the States to inventory and inspect their Federal-aid bridges by July 1, 1973, and re-inspect them at least every 2 years. The standards also established inventory data to be maintained on each bridge, inspector qualifications, and inspection methods.

The Federal-Aid Highway Act of 1970 (Public Law 91-605, sec. 204, 84 Stat. 1713) established the Special Bridge Replacement Program by authorizing \$100 million for fiscal year 1972 and \$150 million for fiscal year 1973 to supplement the States' efforts to replace unsafe bridges. The funds were to be appropriated out of the Highway Trust Fund, and the Federal share of each bridge replacement was limited to no more than 75 percent. Under the act, the Secretary of Transportation, in consultation with the States, was to inventory and classify all Federal-aid bridges located over waterways and topographic barriers according to their serviceability (how well they serve their traffic), safety, and essentiality for public use. Using these classifications, the Secretary was to assign each bridge a priority for replacement. When the States applied for assistance to replace a bridge under the program, the Secretary could approve Federal participation if the priority system showed the bridge to be eligible.

The act did not specify how funds were to be distributed to the States. Initially, while procedures for the program were being developed, the Secretary selected projects for funding from lists submitted by the States of their highest priority bridges. Each State's list could contain up to 10 bridges. After procedures were established, the Secretary assigned each State a share of the remaining authorized funds based on factors such as the cost of projects previously selected by the Secretary and the need for the funds. In addition, FHWA provided each State with a list of from 6 to 32 bridges that had the highest priority for replacement, based on the sufficiency rating.^{1/} The States selected bridges from the lists and applied to FHWA for funding. After the initial bridge inventory and inspection had been substantially completed, the Secretary allocated the funds directly to the States primarily according to each State's relative need (the State's share of the total cost to replace significantly important and unsafe bridges nationwide). FHWA also gave the States a much larger list of eligible bridges that the States could select from to obligate the funds allocated to them.

^{1/}A formula used by the Federal Highway Administration to "prioritize" bridges, which is explained later in the chapter.

The Federal-Aid Highway Act of 1973 (Public Law 93-87, sec. 204, 87 Stat. 250) and the Federal-Aid Highway Act of 1976 (Public Law 94-280, sec. 202, 90 Stat. 425) continued the Special Bridge Replacement Program by authorizing an additional \$585 million from the trust fund for fiscal years 1974-78, as shown below.

<u>Fiscal year</u>	<u>Amount</u>
	(000,000 omitted)
1974	\$ 25
1975	75
1976	125
1977	180
1978	180

The Surface Transportation Assistance Act of 1978 (Public Law 95-599, secs. 124 and 202, 92 Stat. 2689) extended and expanded the Special Bridge Replacement Program to what is currently known as the Highway Bridge Replacement and Rehabilitation Program. Rehabilitation 1/ rather than complete replacement of unsafe bridges was permitted for the first time, and funding was greatly increased over previous authorizations. The \$4.2 billion authorized for the 4 fiscal years 1979-82--\$900 million; \$1.1 billion; \$1.3 billion; and \$900 million, respectively--was about five times more than the \$835 million authorized for the previous 7-year period. However, the program now included bridges off the Federal-aid system and over highways and railroads, and the Federal share of replacement/rehabilitation costs was increased to 80 percent.

The Surface Transportation Assistance Act provided two categories of funds. The first category is apportioned to the States based on their relative share of the estimated cost to replace or rehabilitate deficient bridges. The second category of funds--\$200 million of each year's authorization--is to be used for replacing or rehabilitating bridges whose project costs are more than \$10 million or twice a State's annual apportionment. These projects can be selected at the Secretary of Transportation's discretion.

The act also made the inventory and inspection requirement applicable to off-system bridges. The initial inspections were required to be completed by December 31, 1980. The off-system bridges were also to be classified and assigned priorities for replacement or rehabilitation.

1/The act defined rehabilitation to mean major repairs necessary to restore the structural integrity of a bridge as well as work to correct a major safety defect.

Other Federal-aid highway funds also can be used to replace or rehabilitate Federal-aid bridges. States may use Federal highway safety funds to install traffic control devices and other safety improvements at bridges, and FHWA encourages the States to use their own funds to correct deficiencies both on and off the Federal-aid system.

PROGRAM ADMINISTRATION AND RESPONSIBILITIES

The Secretary of Transportation has delegated administration of the National Bridge Inspection and Highway Bridge Replacement and Rehabilitation Programs to FHWA. FHWA administers the programs through a headquarters office--the Bridge Division in the Office of Engineering--9 regional offices, and 52 division offices--1 in each State. The headquarters office is responsible for developing and recommending program policies, regulations, instructions, and procedures; monitoring and evaluating program effectiveness; and providing technical guidance. The regional offices supervise division office operations, monitor and evaluate division office performance, and provide technical guidance to division offices.

The division offices, each headed by an administrator and under the jurisdiction of the regional offices, are responsible for the day-to-day operations and monitoring of the inspection and replacement/rehabilitation programs. Their responsibilities include reviewing State applications for bridge replacement/rehabilitation funds for approval, monitoring compliance with the National Bridge Inspection Standards and other legal requirements, and providing technical guidance and advice.

The States and/or local governments are responsible for inspecting their bridges in accordance with the National Bridge Inspection Standards. Each State is further responsible for maintaining an accurate and current inventory and submitting specified inventory data 1/ (including inspection results) to FHWA for its national bridge inventory. (For the purposes of the inspection and replacement/rehabilitation programs, FHWA defines a "bridge" as those that are at least 20 feet long.)

Based on the inventory data submitted by the States, FHWA classifies each bridge as "not deficient," "structurally deficient," or "functionally obsolete." FHWA defines a structurally deficient bridge as one that is weak and has been restricted to light vehicles or closed or which needs immediate rehabilitation to remain open. A functionally obsolete bridge is one that has inadequate deck geometry (usually means the deck is too narrow), is improperly aligned with the roadway leading to it, or has an inadequate load-carrying capacity or insufficient underclearances

1/The States' and FHWA's bridge inventory data is computerized.

and as a result is no longer safe. If a bridge is both structurally deficient and functionally obsolete, FHWA classifies it as structurally deficient.

FHWA uses a sufficiency rating to establish funding eligibility, and the States are supposed to use the ratings as a basis for setting priorities for the Highway Bridge Replacement and Rehabilitation Program. The sufficiency rating is a number from 0 to 100 which FHWA arrives at by applying a mathematical formula to the inventory data submitted by the States. The sufficiency rating formula is a method of evaluating the sufficiency of a bridge to remain in service in its present condition. A rating of 100 percent represents an entirely sufficient bridge, and a rating of 0 percent indicates an entirely insufficient, or deficient, bridge. The formula's three general factors and their relative weights are: structural adequacy and safety--55 percent; serviceability and functional obsolescence--30 percent; and essentiality for public use--15 percent.

FHWA submits to the States a listing of bridges that are either structurally deficient or functionally obsolete and have sufficiency ratings of 80 or less. These bridges are eligible for replacement or rehabilitation under the bridge program, and States may select any bridge on the listing and apply for funding to the FHWA division offices. Bridges with sufficiency ratings below 50 can be replaced or rehabilitated, and those with sufficiency ratings 50 through 80 generally can only be rehabilitated.

OBJECTIVES, SCOPE, AND METHODOLOGY

By letters dated April 4 and 16, 1980, Senator James R. Sasser of Tennessee asked us to review the national bridge inspection and reporting system and the distribution of Federal bridge replacement/rehabilitation funds. Based on the request letters and subsequent discussions, we reviewed:

- The Nation's bridge problem and efforts to solve it.
- The distribution of Federal bridge funds to the States and within the States and how projects are selected for funding, including the adequacy of the sufficiency rating formula.
- Bridge inspections and ratings, primarily compliance with the National Bridge Inspection Standards.
- The posting (for lower weight limits) and closing of deficient bridges.
- The bridge inspection programs of Federal agencies that own bridges.

Our review was made at FHWA headquarters in Washington, D.C.; its region 3, 4, 5, and 6 offices in Baltimore, Maryland; Atlanta,

Georgia; Homewood, Illinois; and Fort Worth, Texas, respectively; and in the States of Georgia, Illinois, Louisiana, Pennsylvania, and Tennessee. Within the States, our review was performed at the FHWA division offices, the States' departments of transportation, and other selected locations. We selected Tennessee for review because of Senator Sasser's concern about the bridge problem in his State. The other States were selected because they are among the States with the largest bridge problem, receive considerable Federal bridge funds, and provide geographic coverage. The FHWA regional offices were selected because they are responsible for the States we reviewed.

At FHWA headquarters, regional and division offices, and State departments of transportation, we reviewed policies and procedures and examined pertinent legislation, documents, reports, records, budget and financial data, and correspondence relating to the National Bridge Inspection and Highway Bridge Replacement and Rehabilitation Programs. We interviewed FHWA officials at the headquarters, regional, and division levels and State and local government officials in each of the five selected States. In addition, we contacted representatives and reviewed reports of national organizations such as the American Association of State Highway and Transportation Officials (AASHTO), the National Association of Counties, the National Association of County Engineers, the American Public Works Association, the American Road and Transportation Builders Association, and the American Society of Civil Engineers.

Our analysis of the Nation's bridge problem and what more needs to be done about it was based on examining FHWA reports; national bridge inventory data; State bridge inventory data; reports of national organizations; data presented during congressional hearings; and discussions with representatives of national organizations and officials of FHWA and State and local governments.

We evaluated the adequacy of the sufficiency rating formula by reviewing FHWA instructions, comments received by AASHTO during its 1976 review of the FHWA formula, comments received by FHWA on proposed regulations for the Highway Bridge Replacement and Rehabilitation Program, and National Association of Counties and American Public Works Association summaries of comments received during a series of seminars the associations held for FHWA to explain the bridge programs to local officials. A major subject of the seminars was sufficiency ratings. We also discussed sufficiency rating use and adequacy with FHWA, State, and local officials and organizations such as AASHTO, the American Society of Civil Engineers, and the National Association of Counties.

To evaluate bridge inspections and ratings, we reviewed FHWA and State efforts to ensure accuracy, reliability, and consistency. We examined the States' compliance with the National Bridge Inspection Standards with regard to inspector qualifications and training, reinspection intervals, inspection reporting,

and records. We also examined and compared FHWA and State inspection and reporting manuals, guidelines, and instructions and inspection files for completeness and consistency. We discussed inspection procedures and practices with FHWA, State, and local government officials. We visited bridges and observed several inspection teams during inspections. However, we did not make our own independent inspections.

To evaluate bridge posting and closing, we reviewed the five selected States' policies and practices and compared bridges recommended for posting and closing with those bridges posted and closed according to the inventory data and/or inspection files. We also discussed posting and closing with FHWA, State, and local government officials and reviewed pertinent FHWA and State documents.

Throughout our review, we examined the national bridge inventory and the five selected States' inventory data for apparent inconsistencies. We also performed limited tests of the data and reviewed FHWA and State efforts to ensure data accuracy and reliability. We found some data problems, which are discussed in chapters 5 and 6.

Our review of the inspection programs of Federal agencies that own bridges included discussions with officials of the agencies, FHWA, and selected States and examinations of pertinent inventory data.

CHAPTER 2

THE BRIDGE PROBLEM AND EFFORTS TO SOLVE IT

According to FHWA's national bridge inventory data, about 200,000 bridges--or about 4 out of every 10--are deficient. Many of these bridges increase the potential for accidents, limit the use of the roads and highways, and cause traffic congestion and additional travel time. They contribute to an increase in traffic deaths, injuries, property damage, fuel consumption, air pollution, and the cost of goods and services. FHWA estimates that it would cost \$41.1 billion to replace or rehabilitate deficient bridges. The total cost is expected to go up because the estimate does not include some off-system bridges that had not been inspected and/or reported to FHWA at the time the estimate was made. Furthermore, additional bridges are expected to need replacing or rehabilitating as they wear out or other problems develop. Continued high inflation in construction costs would substantially add to the estimate.

An assortment of Federal, State, and local funds are used to replace or rehabilitate deficient bridges. The Highway Bridge Replacement and Rehabilitation Program, however, is the major single source of funds. In fiscal years 1979-82, the program provided an average of about \$1 billion per year. At current funding levels, the 200,000 deficient bridges already identified could not be replaced or rehabilitated by the end of this century.

THE BRIDGE PROBLEM

The Nation's many deficient bridges are of special concern. Failures can cause substantial loss of life, especially for bridges over water, and repair or replacement is usually much more expensive and more disruptive to traffic than other types of highway improvements. In addition, structurally deteriorated or weak bridges interrupt orderly, efficient traffic flow. Bridges with poorly aligned approaches, inadequate clearances, or narrow decks are safety hazards.

The nature and severity of the bridge problem

There are about 514,000 1/ bridges nationally with about 258,000 bridges on the Federal-aid system and 256,000 off the system. Almost 25 percent of all Federal-aid bridges are deficient, and over 50 percent of the off-system bridges are deficient.

1/The number of bridges used in this report is the number reported in the national bridge inventory as of October 1980. FHWA estimates that there are an additional 52,000 off-system bridges that have not been added to the inventory that would increase the total to over 566,000 bridges.

On the Federal-aid system, most of the deficient bridges are functionally obsolete; according to FHWA officials, most of these bridges are too narrow. Most of the deficient off-system bridges are structurally deficient.

The table on the following page shows bridge conditions both on and off the Federal-aid systems, according to the latest available national bridge inventory data. The table shows that slightly more than half of all deficient bridges are functionally obsolete. Many bridges are or should be closed or restricted to lighter vehicles. About 17 percent of all bridges are in a critical or basically intolerable overall structural condition that warrants a high priority for repair or replacement or immediate repair or replacement to put them back in service.

Bridge conditions are worse off the Federal-aid system. Over half the bridges are deficient and a much larger percentage are structurally deficient. Many more are in a critical or basically intolerable overall structural condition; many are posted, for lower weight limits, and 3,400 are reported as closed.

Some States have a larger bridge problem than others. Nationwide, about 29 percent of the off-system bridges are structurally deficient and 25 percent are functionally obsolete. In Georgia 48 percent of the off-system bridges are structurally deficient and about 19 percent are functionally obsolete. About 43 percent of Tennessee's off-system bridges are structurally deficient and an additional 21 percent are functionally obsolete. Many of these bridges are in serious condition. For example, as of December 1980 about 8 percent, or 1,344 bridges, in Tennessee had been recommended for closure because they could not safely carry vehicle traffic. (All but 30 of the bridges are off-system bridges.) Tennessee officials estimate that it could cost around \$250 million to replace 1,302 of these off-system bridges recommended for closure.

The bridge problem also varies among localities. Some counties and cities have only a few deficient bridges while others have serious problems. The Pennsylvania Department of Transportation has estimated that the Pittsburgh area needs over \$1 billion for its bridges. In addition, a task force of the Federal City Council of the District of Columbia (a private, nonprofit organization of business and civic leaders) studied District road and bridge needs. The task force estimated that needed bridge work would cost about \$86 million, about 10 times the District's proposed capital budget for bridges in fiscal year 1981. The same task force found that Cleveland, Ohio, estimated that it would need about \$150 million to bring up to standards the deficient bridges for which the city had full maintenance responsibility. New York City estimated that it would need \$486 million for a 5-year crash effort on 1,000 bridges in the worst need (200 bridges per year) and a 40-year effort on the remaining 1,000 bridges (50 bridges per year).

Nationwide Bridge Conditions
as of October 31, 1980

	Federal-aid system	Off-system (note a)	Total
Total number of bridges	257,959	256,277	514,236
Number of deficient bridges	61,885	138,235	200,120
Percentage of deficient bridges	24	54	39
Square footage of deficient bridges (in millions)	822.9	287.9	1,110.8
Number of structurally deficient bridges	23,528	74,649	98,177
Percentage of structurally deficient bridges	9	29	19
Square footage of structurally deficient bridges (in millions)	592.7	210.0	802.7
Number of functionally obsolete bridges	38,357	63,586	101,943
Percentage of functionally obsolete bridges	15	25	20
Square footage of functionally obsolete bridges (in millions)	230.2	77.9	308.1
Number of bridges whose overall structural condition is rated critical or basically intolerable (note b)	19,466	68,203	87,669
Percentage of total bridges rated in overall critical or basically intolerable struc- tural condition	8	27	17
Square footage of bridges rated in critical or basically intolerable structural condition (in millions)	105.7	182.5	288.2
Number of bridges that are or should be posted for lower load limits	26,350	93,502	119,852
Percentage of total bridges that are or should be posted for lower load limits	10	36	23
Number of bridges reported closed (note c)	325	3,400	3,725

a/The data in the national bridge inventory represents 83 percent of the 310,000 off-system bridges estimated as of December 31, 1980. This matter is discussed further in ch. 5.

b/This term refers to those bridges for which the States and local governments have rated overall structural condition as basically intolerable and requiring high priority for repair or replacement, or needing immediate repair or replacement to put them back in service.

c/Represents closed bridges reported by FHWA as of December 31, 1980. Although inventory records show 588 Federal-aid bridges closed as of October 31, 1980, FHWA told us its field offices reported 325 closed Federal-aid bridges. Also, one State asked FHWA to disregard the number of its closed off-system bridges in the national inventory. This request was honored and resulted in a revised figure of 3,400 as compared to the 5,727 figure shown in the inventory. These matters are discussed further in chs. 5 and 6.

Reasons for bridge deficiencies

Structural deficiencies occur principally because of lack of proper maintenance due to insufficient funds, exposure to the elements, general wear, and poor initial design. The major reasons for functional obsolescence are increased traffic, changing traffic patterns, and higher safety standards. Many bridges are deficient largely because of advanced age. About 75 percent of all bridges were built before 1935. Many of these old bridges have passed or are approaching the end of their useful life.

Many of these bridges were designed and built at a time of less traffic, slower speeds, many one-lane roads, smaller automobiles, and fewer large trucks and buses. Often roads have been improved to accommodate traffic, but because of high costs the bridges are not rehabilitated or replaced to fit the new highway and/or to meet current safety standards.

Impact of structurally deficient bridges

Structurally deficient bridges are weak and inadequate to carry all types of traffic. They should be restricted to light vehicles or closed. FHWA and the States do not compile complete data on bridge collapses; however, FHWA estimates that about 150 bridges collapse each year, killing about 12 people. In the five States we visited, FHWA and State officials were aware of only a few bridges that had collapsed and very few lives were lost. However, a collapse can be dramatic and catastrophic, as in the Silver Bridge failure when 46 people were killed and 9 were injured. One person was killed and another injured in a more recent collapse of a major bridge in Memphis, Tennessee. In addition, the bridges are out of service until they can be replaced. Several State and FHWA officials told us that inspections are identifying many unsafe bridges, and the bridges are closed or posted to prevent them from collapsing.

A structurally deficient bridge that is properly posted and the posting is observed can be safely used by vehicles equal to or less than the posted weight. But the efficient and economic flow of traffic is interrupted for vehicles exceeding the weight. Trucks and school buses may have to be rerouted, which increases travel mileage, time, and costs. Closed bridges further limit the highways' use. If posting or closure is ignored, the bridge can collapse or receive further damage. (See ch. 6 for a more detailed discussion of bridge posting and closing.)

An example of the impact that a posted bridge can have is the Thompson Run Bridge in Pittsburgh, Pennsylvania. The bridge was posted in August 1978 at a 5-ton weight limit. U.S. Steel, which has a plant near the bridge, has calculated that the posting is costing it \$1 million per year because 350 trucks per day that would use the bridge must take an 18-mile, 1-way detour. The Pennsylvania Department of Transportation calculated the extra cost in time and fuel for heavy trucks to detour around the

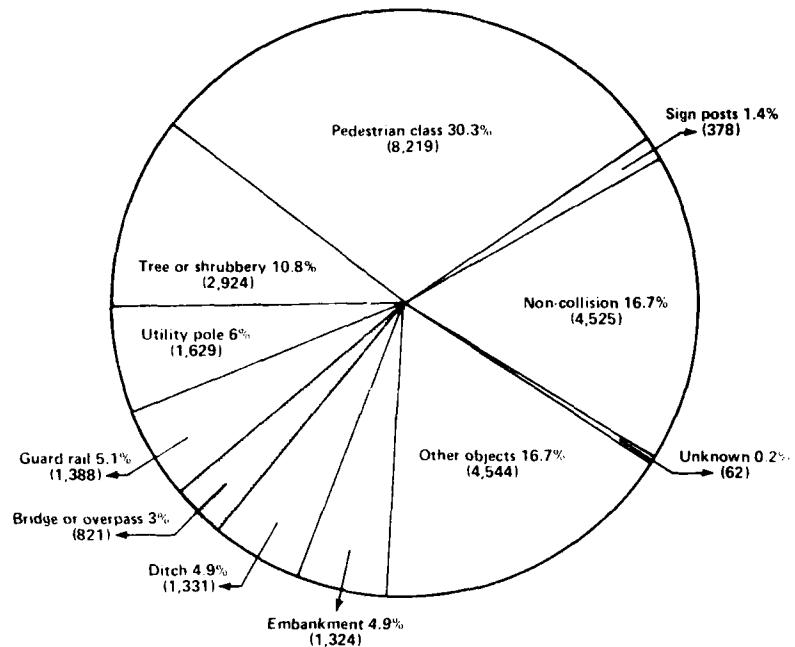
bridge at \$12 million for the 4-year period of weight restriction. The State plans to rehabilitate it in the near future at an estimated cost of \$2.8 million. Another example is a bridge in Shippensburg, Pennsylvania, that is posted with a 10-ton limit. Because of the weight limit, fire trucks must use a detour to reach some areas which causes a 5- to 7-minute delay in responding to a call.

Impact of functionally obsolete bridges

Functionally obsolete bridges are, for the most part, narrow bridges with inadequate lane width or no shoulders and bridge decks narrower than the approach roadway. Studies by FHWA and others have shown that accidents and fatalities increase on narrow bridges. State and local government officials that we talked to confirm the studies' conclusion. The hazard can vary from one narrow bridge to another, depending on such factors as amount and type of traffic, how narrow the bridge is, sight distance, and approach roadway alignment.

One figure often used to demonstrate the impact of functionally obsolete bridges is the number of fatalities in traffic accidents where the first harmful event (the first event in which injury or property damage occurred) was the vehicle's collision with a bridge or overpass. For 1978 and 1979, National Highway Traffic Safety Administration data showed 1,057 and 976 deaths, respectively, in these collisions. The chart on the following page shows that of 27,145 fatal single-vehicle accidents in 1979, 3 percent hit a bridge or overpass.

DISTRIBUTION OF FATAL SINGLE-VEHICLE ACCIDENTS IN 1979 BY FIRST HARMFUL EVENT



SOURCE National Highway Traffic Safety Administration's Fatal Accident Reporting System Data

We were unable to obtain data on all bridge-related accidents; however, the chief of Georgia's Office of Traffic Safety provided us the following information on bridge-related accidents in Georgia in 1978, 1979, and 1980.

Bridge-Related Accidents in Georgia
1978-80

<u>Number</u>	<u>1978</u>	<u>1979</u>	<u>1980</u> (note a)
Accidents	1,620	1,754	2,218
Injuries	1,165	1,285	1,616
Fatalities	80	74	80
Property damage	\$2,078,200	\$2,540,400	\$2,724,000

a/The chief of the Office of Traffic Safety projected the 1980 totals based on the first 6 months of the year.

The above FHWA and State of Georgia statistics do not indicate how many of the deaths occurred on functionally obsolete bridges as opposed to all bridges or how many deaths would have been prevented if the functionally obsolete bridges had been replaced. For example, a 1973 FHWA study entitled "Cost-Effectiveness of Safety Improvement Projects" reviews 46 projects in which 26 bridges were widened and 20 bridges were replaced. In the year before the improvements, 130 accidents with 83 injuries and 4 deaths occurred. In the year after the improvement, there were 65 accidents, 31 injuries, and 1 death. The percent change in accidents and injuries was considered statistically significant, but the change in fatalities was not.

In addition to creating safety hazards, functionally obsolete bridges can act as bottlenecks, slowing down traffic and creating congestion. Farm equipment cannot be moved over some roads in rural areas because narrow bridges and those with inadequate clearances will not accommodate the equipment. Travel time, driver frustration, fuel consumption, air pollution, and cost of goods and services can increase.

Solving the bridge problem is a formidable task

Replacing or rehabilitating the Nation's deficient bridges is a very costly undertaking; FHWA estimates the cost at \$41.1 billion. FHWA's estimate, as shown on the following page, is based on its analysis of Federal-aid system bridge data and a projection of the off-system information in the national bridge inventory as of December 31, 1980.

FHWA Estimate To Replace or Rehabilitate

Deficient Bridges as of December 1980

<u>System</u>	Bridges eligible for replacement or rehabilitation	Estimated replacement cost (billions)	Bridges eligible for rehabilitation only	Estimated rehabilitation cost (billions)	Total eligible bridges	Total cost (billions)
Federal-aid	25,100	\$11.7	30,500	\$ 8.9	55,600	\$20.6
Off-system (projection)	109,000	16.4	44,700	4.1	153,700	20.5
Total	<u>134,100</u>	<u>\$28.1</u>	<u>75,200</u>	<u>\$13.0</u>	<u>209,300</u>	<u>\$41.1</u>

The number of deficient off-system bridges is substantially higher than the number of deficient bridges on the Federal-aid system, but the Federal-aid bridges are on the average larger and cost more to replace or rehabilitate.

The cost estimate is expected to increase as additional bridges need replacing or rehabilitating. According to FHWA, bridges have a useful life of about 50 years, and some will need replacing or rehabilitating each year. (An average of 11,320, or 2 percent, of the estimated total of 566,000 bridges would need replacing each year if the average life is 50 years.) Inflation would also increase the cost estimate. FHWA's construction (road and bridge) price index increased 146 percent from 1970-79, which is greater than the 87-percent increase in the consumer price index. The same rate of inflation for the next 10 years would more than double the cost.

As shown on the following page, FHWA's cost estimates have substantially increased in the past few years. These cost estimates were contained in FHWA's annual reports to the Congress on the bridge replacement/rehabilitation program.

<u>Date of annual report</u>	<u>Federal-aid system</u>		<u>Off-system (note a)</u>		<u>Total</u>	
	<u>Number of deficient bridges</u>	<u>Estimated cost</u>	<u>Number of deficient bridges</u>	<u>Estimated cost</u>	<u>Number of deficient bridges</u>	<u>Estimated cost</u>
	(billions)		(billions)		(billions)	
Dec. 1973	24,000	\$ 4.2	N.R.	N.R.	24,000	\$ 4.2
Dec. 1974	32,420	10.4	N.R.	N.R.	32,420	10.4
Mar. 1976	34,696	10.4	N.R.	N.R.	34,696	10.4
May 1977	39,920	12.4	65,600	\$10.6	105,520	23.0
Apr. 1978	b/33,515	b/12.5	72,000	12.6	105,515	25.1
Jun. 1979	40,653	16.3	64,800	13.0	105,453	29.3
Jul. 1980	c/56,709	c/18.3	d/82,931	d/14.9	139,640	33.2
Mar. 1981	55,600	20.6	d/153,700	d/20.5	209,300	41.1

a/Federal law did not require inspection and reporting of off-system bridge conditions to FHWA until Nov. 1978, and off-system bridges did not qualify for funding under the replacement/rehabilitation program until that date. The Secretary of Transportation did not report (shown in the chart as N.R. or not reported) on off-system bridges until May 1977.

b/According to FHWA, a reorganization of the Federal-aid system required by the Federal-Aid Highway Act of 1973 removed many deficient secondary road bridges from the inventory. Some urban bridges were added to the system, but they had not been inspected.

c/According to FHWA, the major reason for the large increase in deficient bridges in 1980 was a change in the definition of deficient to include bridge rehabilitation as part of the overall bridge program.

d/The 1980 and 1981 off-system estimates were based on projections of the deficient off-system bridges in the national bridge inventory as of Dec. 31, 1979, and Dec. 31, 1980, respectively, to account for bridges that had not yet been inspected or inspection data that had not been analyzed.

The major reason for the large increase in total number of deficient bridges was the inclusion of off-system bridges in the inspection and replacement/rehabilitation programs. However, the number of Federal-aid bridges also increased sharply from 24,000 in 1973 to almost 56,000 in 1981. According to FHWA, the increase was due primarily to more complete inventory submissions by the States and the change in its definition of deficient to include

certain additional bridges in need of rehabilitation. (See ch. 4 for a further discussion of how FHWA defines a deficient bridge.)

Federal, State, and local officials confirm
the severity of the bridge problem

Federal, State, and local officials and representatives of organizations such as AASHTO and the National Association of Counties that we contacted agreed that the bridge problem is serious. According to these officials, the bridge problem is a national concern because of the safety and economic impact and because the cost to replace or rehabilitate deficient bridges is beyond State and local resources.

EFFORTS TO REPLACE OR REHABILITATE
DEFICIENT BRIDGES

Federal, State, and local funds are being used to replace or rehabilitate deficient bridges. The Federal Government has provided funds under the Federal bridge replacement/rehabilitation, other Federal-aid highway, and disaster relief programs. State and local governments have financed bridge replacement and rehabilitation with their own funds from sources such as general revenue, highway programs, highway user taxes, and bond issues. Some local governments have reportedly used other Federal funds such as revenue sharing funds to replace or rehabilitate deficient bridges.

Federal funds

Federal bridge replacement/rehabilitation
program

As discussed in chapter 1, authorizations for the Special Bridge Program (fiscal years 1972-78) and the Highway Bridge Replacement and Rehabilitation Program (fiscal years 1979-82) were \$835 million and \$4.2 billion, respectively, for a total of about \$5 billion. Authorizations averaged about \$120 million per year for the Special Bridge Program and slightly over \$1 billion for the latter program. Not all these funds have been used for bridge replacement and rehabilitation. Currently, about 2 percent of each fiscal year's authorization has been set aside for FHWA administrative costs.^{1/} During the earlier years of the program, the percentage of funds set aside for this purpose fluctuated from 2 to 3 percent. For fiscal years 1972-80, the amount for this purpose totaled about \$59 million. In addition, FHWA reports that some 33 States have used \$41.8 million of their apportionment for off-system bridge inventory, inspection, and classification.

^{1/}The 2 percent is combined with funds from other FHWA programs and used collectively for administering FHWA activities.

As of December 31, 1980, FHWA had approved funding for the replacement or rehabilitation of 6,325 bridges. The following table shows the status of the approved projects by program category and stage of construction, as reported by FHWA.

	<u>Preliminary engineering</u>	<u>Construction</u>	<u>Complete</u>	<u>Total</u>
Special Bridge Replacement Program	<u>298</u>	<u>264</u>	<u>1,271</u>	<u>1,833</u>
Highway Bridge Replacement and Rehabilitation Program:				
Mandatory 65-percent Federal-aid	1,350	903	309	2,562
Mandatory 15-percent off-system	581	610	234	1,425
Optional 20-percent Federal-aid/off-system	130	249	60	439
Discretionary	<u>31</u>	<u>32</u>	<u>3</u>	<u>66</u>
	<u>2,092</u>	<u>1,794</u>	<u>606</u>	<u>4,492</u>
Total	<u>2,390</u>	<u>2,058</u>	<u>1,877</u>	<u>6,325</u>

As shown above, 1,877 bridges have been replaced or rehabilitated during the first 9-1/2 years of program funding. The rate of completed projects, however, should accelerate. Another 4,448 projects are being prepared for or are in the process of construction, and many more projects are being approved annually under the expanded program funding. In a little over 2 years of the Highway Bridge Replacement and Rehabilitation Program, over twice as many projects have been approved as were approved under the 7 years of the Special Bridge Replacement Program. However, the 4,492 bridges approved under the Highway Bridge Replacement and Rehabilitation Program would only be about 2 percent of the deficient bridges already identified. All the projects approved since the beginning of the program would be about 3 percent of deficient bridges.

Other Federal-aid highway program funds

According to FHWA data, the States used about \$204 million of Federal-aid highway funds in fiscal years 1979 and 1980 for bridge replacement or widening. Ten States accounted for about 80 percent of the total. The States have also used other Federal-aid highway funds for lesser work such as pavement marking, railing replacement, and traffic control devices to improve safety at bridge sites. Some States have also used Federal-aid highway safety funds for off-system bridge inspections. FHWA Bridge Division officials told us that their recent telephone survey of

the States, made to respond to a congressional committee question, found that for fiscal years 1979-80 the States spent about \$1.6 billion of other Federal-aid highway funds in each of the 2 years on all types of bridge work. No details on the survey results were available.

Other Federal funds

Some bridges have reportedly been replaced or rehabilitated with other Federal funds such as revenue sharing and disaster relief, but the amount of these funds is small compared to Federal bridge and highway funds. For example, we were unable to readily obtain complete information on the amount of disaster relief funds and the number of bridges replaced or rehabilitated with the funds (bridges are usually a part of a project and bridge expenditures are not reported separately); however, FHWA reported that 29 Federal-aid bridges that were candidates for the Special Bridge Replacement Program had been replaced with emergency relief funds through October 31, 1978.

State and local funds

State and local governments use their own funds to match Federal-aid funds and, in some cases, to finance bridge replacement or rehabilitation on their own. State and local funds may derive from general revenue, highway user taxes, and bond issues.

We were unable to obtain data on the total amount of funds and the number of bridges replaced or rehabilitated with State and local funds. But based on data obtained during our review, it appears that the number of bridges replaced or rehabilitated solely with State and local financing is less than the number replaced or rehabilitated with Federal assistance. In its June 1979 annual report, FHWA reported that 806 Federal-aid bridges that were candidates for replacement under the Special Bridge Replacement Program had been or were being replaced without Federal-aid. In comparison, FHWA reported that 2,749 such bridges were replaced or were being replaced with Federal assistance. (FHWA no longer develops data on bridges replaced or rehabilitated without Federal-aid funds.) The States and local governments, however, are also responsible for bridge maintenance and repairs and replacing or rehabilitating the unknown thousands of bridges that are less than 20 feet in length and do not qualify for the Federal program.

According to FHWA Bridge Division officials, their recent telephone survey of the States indicated that for fiscal years 1979 and 1980 together, the State and local governments spent about \$2.5 billion of their own funds on new bridges and replacing or rehabilitating existing bridges. According to the officials, these funds included (1) 100 percent State or locally funded bridges, (2) matching shares for the Federal bridge

program, and (3) matching shares for other Federal-aid funds. Details of the survey were not available.

THE BRIDGE SITUATION IN SELECTED STATES

The following discussion of the bridge situation in three States that we visited illustrates the problem facing many of the States.

Georgia

Georgia has about 14,700 bridges, of which 7,451, or about 51 percent, are deficient. About an equal number are structurally deficient and functionally obsolete. Bridge problems differ markedly on the Federal-aid and off-system. The major problem on the Federal-aid system is functionally obsolete bridges--87 percent of the deficient Federal-aid bridges are functionally obsolete. The major problem with off-system bridges is structural deficiency--about 72 percent of the deficient off-system bridges are structurally deficient. Georgia Department of Transportation officials had made no overall estimate of the total cost to replace or rehabilitate all of the State's deficient bridges. However, they said the cost would be substantially greater than currently available resources.

Georgia uses Highway Bridge Replacement and Rehabilitation Program, other Federal-aid highway, and State funds to replace and rehabilitate deficient bridges. State funds are used to match Federal assistance and to provide assistance to local governments under the State's Local Assistance Bridge Program. The following table shows Georgia's obligations for bridge replacement and rehabilitation during fiscal years 1979-80 and the first part of fiscal year 1981.

	Fiscal year 1979 Obligations	Number of bridges	Fiscal year 1980 Obligations	Number of bridges	Fiscal year 1981 (as of Nov. 20, 1980) Obligations	Number of bridges
Highway Bridge Replacement and Rehabilitation Program	\$16,516,000	64	\$22,998,000	102	\$1,239,000	3
Other Federal sources (note a)	9,770,000	54	17,139,000	16	2,652,000	2
Georgia Department of Transportation (note b)	16,165,000	83	9,381,000	18	1,800,000	1
Total	<u>\$42,451,000</u>	<u>201</u>	<u>\$49,518,000</u>	<u>136</u>	<u>\$5,691,000</u>	<u>6</u>

a/Other Federal sources include Federal-aid primary, Federal-aid urban, Federal-aid interstate, safer off-system roads, and Federal-aid secondary funds.

b/State matching funds for Federal programs and Local Assistance Bridge Program. The number of bridges shown is for the Local Assistance Bridge Program only. Bridges for the matching funds for Federal programs are shown in the above two categories.

In fiscal years 1979-81, Georgia received \$16.5 million, \$23.1 million, and \$24.4 million, respectively, in Highway Bridge Replacement and Rehabilitation Program funds. From the beginning of the program through fiscal year 1981, Georgia received a total of about \$80.3 million.

Illinois

According to State inventory data, Illinois has 8,947 deficient bridges--5,452 are structurally deficient and 3,495 are functionally obsolete. Of the total, 6,823, or 76 percent, are off the Federal-aid system. Illinois estimated that it would cost about \$2.6 billion to currently replace or rehabilitate all its deficient bridges or about \$4 billion over the next 5 years. The State estimated short-term needs of \$1.03 billion to replace or rehabilitate 2,800 deficient bridges.

The Federal Government, through the Highway Bridge Replacement and Rehabilitation Program and other Federal programs, plays a major role in Illinois bridge replacement/rehabilitation. Illinois was allocated about \$255 million from the beginning of the bridge program through fiscal year 1981. In fiscal years 1980 and 1981, Illinois received \$70.2 million and \$74.3 million, respectively. In both years this was the maximum allowed any one State under the program. According to Illinois Department of Transportation officials, an additional \$20 million in fiscal year 1979 and \$28 million in fiscal year 1980 Federal-aid primary and interstate transfer funds were also used for bridges.

The State and local governments have also contributed funds to solving the bridge problem. In fiscal year 1979 the State contributed about \$10 million, of which about \$5 million was for its required share of the Highway Bridge Replacement and Rehabilitation Program. Half of the other \$5 million in State funds was provided to local governments under their Township Bridge Program. In fiscal year 1980, the State contribution was about \$40 million--about \$11 million in Highway Bridge Replacement and Rehabilitation Program matching funds and about \$29 million in other State funds, of which \$15 million was for the Township Bridge Program.

The Illinois General Assembly apportions the Township Bridge Program funds to counties for the construction of bridges 20 feet or more in length. It apportions funds based on the total mileage of township or district roads in the county in relation to the total mileage of all township and district roads in the State. No allocation is made to any road district which has not levied local taxes for road and bridge purposes at the maximum rates permitted by the general tax levy for roads, the tax for construction of bridges, and the county unit road district tax.

According to a State of Illinois official, the Township Bridge Program requires an 80/20 State-local match as of fiscal year 1981. Previously, a dollar-for-dollar match was required. Township Bridge Program funds may be used by local governments for part of their Highway Bridge Replacement and Rehabilitation Program match. For example, this program allows a county to finance a \$100,000 project using 80 percent Highway Bridge Replacement and Rehabilitation Program funds, 16 percent Township Bridge Program funds, and 4 percent local funds.

Local governments raise bridge funds through the levy of county highway, bridge, and matching taxes. They contributed about \$7 million for bridges in fiscal year 1979--about \$4.5 million in Highway Bridge Replacement and Rehabilitation Program matching and about \$2.5 million in Township Bridge Program matching. In fiscal year 1980 they contributed about \$5.5 million and about \$15 million, respectively, to match the two programs. Illinois Department of Transportation officials said local governments may have spent other local funds on bridge replacement and repair, but the department had no way of knowing this. The officials assumed local governments would try to match funds raised locally with available Federal and State funds.

Pennsylvania

According to State inventory data as of November 1980, Pennsylvania had 20,608 bridges of which about half were on the Federal-aid system and half were off the system. A considerable number of the bridges are more than 50 years old and, therefore, were not originally designed to handle today's type and volume of highway traffic. The older bridges, even if well maintained and structurally sound, may very well be functionally obsolete today because of changes in safety standards and design criteria.

The bridge inspections, made in accordance with the national bridge inventory requirements, disclosed that many of Pennsylvania's bridges are deficient and in need of replacement or rehabilitation. Of the 10,272 bridges on the Federal-aid highway system, 966, or 9 percent, were structurally deficient, and 600, or 6 percent, were functionally obsolete as of November 1980. Inspections of the 10,336 off-system bridges were about 75 percent complete as of October 31, 1980, and had disclosed that 1,617 bridges (16 percent) were structurally deficient and 918 (9 percent) were functionally obsolete.

The Road Information Program (TRIP) ^{1/} estimated that it would cost \$2.8 billion to replace or rehabilitate all of Pennsylvania's deficient bridges. In comparison, Pennsylvania has received about \$165.1 million in Federal bridge replacement and rehabilitation funds from the program's beginning through fiscal year 1981. About \$104.4 million was received in the last 2 fiscal years.

The Pennsylvania Department of Transportation has developed a plan for bridge replacement and rehabilitation for the 12 fiscal years 1981-92 which, when completed at a cost of \$1 billion, will correct the problems on 760 bridges, about 19 percent of the State's 4,101 deficient bridges. The 12-year bridge plan is to be mainly funded by the Highway Bridge Replacement and Rehabilitation Program and supplemented by other highway funds. The goal of correcting problems on 760 bridges depends on continued funding from the bridge program at current levels plus an increase for inflation. Pennsylvania highway officials estimated that if the funding level is not increased for inflation, only 525 bridges will be replaced or rehabilitated. The Highway Bridge Replacement and Rehabilitation Program funds are about 75 percent of the total moneys to be used under the plan. The remainder is made up of other Federal-aid highway, State, and local funds. State and local funds are generally provided to meet the required match for the Federal funds.

CONCLUSIONS

The United States has over half a million bridges, about 75 percent of which were built before 1935. These bridges have exceeded or are approaching the end of their useful life, which is generally about 50 years. They were designed and built when the amount of traffic was much less, speeds were slower, vehicles were lighter, and fewer trucks and buses were on the roads. Many bridges have been weakened by weather, erosion, usage, and other

^{1/}A nonprofit organization that is sponsored by road builders; construction-equipment manufacturers and suppliers; and other businesses involved in highway engineering, construction, and financing. TRIP researches, evaluates, and distributes economic and technical data on transportation issues.

factors. Lack of proper maintenance and poor initial design, construction, and materials have added to the problem. Even more bridges are structurally sound but not suitable for today's traffic. These functionally obsolete bridges generally do not meet current safety standards. For the most part they are too narrow and in some cases they are poorly aligned with the roadway, have insufficient clearances, or were not designed to support the weight of modern vehicles.

According to FHWA data, about 200,000, or 40 percent, of all bridges are deficient--98,000 are structurally deficient and 102,000 are functionally obsolete. About 120,000 are or should be restricted to lighter vehicles. As reported by FHWA, over 3,700 bridges are closed to traffic. The problem is greater for bridges off the Federal-aid system. Over half the off-system bridges are deficient compared to the 24 percent on the Federal-aid system. Almost four times as many off-system bridges are posted, and over 90 percent of the bridges reported as closed are off the Federal-aid system.

Deficient bridges have a safety, economic, energy, and quality of life impact. Many of these bridges limit the use of roads and highways and cause increased accidents, traffic congestion, travel time, driver frustration, and fuel consumption. The price of goods and services is increased because of additional travel time and mileage.

The cost to eliminate deficient bridges would be tremendous. FHWA's estimates the cost to replace or rehabilitate deficient bridges as of December 1980 to be \$41.1 billion. Additional bridges will need replacing or rehabilitating in the future as they wear out or they can no longer safely service traffic. Inflation will add to the cost. If construction costs continue to increase at the current rate, replacement and rehabilitation costs will more than double in the next 10 years.

Various Federal, State, and local funding sources are being used to replace or rehabilitate deficient bridges. While the extent of State and local effort varies, the Federal Government, and in particular the Highway Bridge Replacement and Rehabilitation Program, generally has become the major funding source for the States. Costs to replace or rehabilitate deficient bridges are substantially greater than the resources that are being made available. All the bridges approved for replacement or rehabilitation under the bridge program from its beginning through December 1980 are only about 3 percent of the bridges that are deficient.

Continued high Federal funding levels and greater State and local efforts will be needed to reduce the bridge problem. Even with increased funding, the United States may have a large number of deficient bridges for many years to come. A large infusion of funds would be required to eliminate all deficient bridges by the end of this century.

CHAPTER 3

METHODS FOR DISTRIBUTING FEDERAL BRIDGE FUNDS COULD BE IMPROVED

The distribution of program funds to the States is based on outdated and incomplete data needs. As a result, some States are receiving substantially less funds than they should and some are receiving more. Furthermore, some local government officials have expressed concern that State governments, who have the authority to decide how the funds are to be used within the States, will not fairly consider local government needs. The concern is that even though both State and local governments own bridges, State governments will use more of the funds on State government bridges. FHWA is not formally monitoring distribution of funds within the States, except to ensure that the required amounts are used for off-system bridges.

BETTER DISTRIBUTION OF FUNDS TO THE STATES COULD MAKE THE PROGRAM MORE EFFECTIVE

Since the early part of the bridge program, the funds have been allocated to the States based on their relative needs in accordance with the congressional intent. That is, more funds have been provided to the States whose costs to replace their deficient bridges (actually deficient Federal-aid bridges in the national bridge inventory) would be the greatest. The Congress and FHWA considered allocating the funding in this manner to be the most effective means to address the unsafe bridge problem.

Before the 1978 Surface Transportation Assistance Act, FHWA annually decided how much of each year's authorization the individual States were to receive based on the States' relative needs (cost to replace deficient bridges) as reported to FHWA by the States. The Surface Transportation Assistance Act, however, provided that the bridge funds, except for the discretionary funds (\$200 million annually), the funds for FHWA administrative costs and funds for two demonstration bridge projects, ^{1/} are to be allocated to the States according to apportionment factors approved by the House Committee on Public Works and Transportation in October 1978. The act, dated November 6, 1978, specified that

^{1/}Section 147 of the 1978 Surface Transportation Assistance Act required the Secretary of Transportation to carry out two projects to construct or replace high traffic volume bridges located on the Federal-aid system and over major bodies of water to demonstrate the feasibility of reducing the time required to replace unsafe bridges. In fiscal year 1979, \$54 million of bridge program funds was authorized for the demonstration projects. An additional \$145.8 million was authorized for fiscal year 1981.

the Secretary of Transportation apply these factors to the authorization for each of the fiscal years 1979-82. The factors were based on each State's share of the cost to replace deficient Federal-aid bridges nationwide. The act first made off-system bridges eligible for the funds, but the initial off-system inspections were not required to be completed until December 31, 1980. Thus, only Federal-aid bridge needs were included in the apportionment factors, and the act contained no provision to allow FHWA to update the apportionment factors to reflect current needs.

The distribution of discretionary funds by FHWA, which is done on a project-by-project basis, is discussed in chapter 4.

Distribution to the States is based on outdated and incomplete needs data

The apportionment factors used to allocate bridge funds to the States, except for a change by the House Public Works and Transportation Committee in the minimum/maximum percentages, are the same as those FHWA developed and sent to the committee in May 1978. FHWA calculated each State's need (replacement cost) as its square footage of deficient Federal-aid bridges multiplied by the State's average bridge construction cost per square foot. According to FHWA Bridge Division officials, the square footage was based on data reported to FHWA for the national bridge inventory between October 1977 and April 1978. The average construction costs were the average for 1977. This information was the latest available at that time. However, new data was submitted the following year and there are annual updates based on re-inspections. The data on the numerous off-system bridges was also not available at that time.

Updating to reflect current needs would have made a substantial difference in the States' apportionments. For example, FHWA headquarters prepared revised State needs for fiscal years 1980 and 1981 1/ based on updated inventory and cost data. We compared the actual fiscal year 1980 and 1981 apportionments for each State to what would have been apportioned if the revised State needs for Federal-aid bridges had been used. Alaska, Delaware, Nevada, Utah, and Wyoming would still have received the minimum and New York the maximum apportionment, but the variances were large for most States. The following are examples of the more significant variances:

--Louisiana's apportionment would have decreased by \$21 million in fiscal year 1980 and \$28 million in fiscal year 1981.

1/For the fiscal year 1981 needs calculation, FHWA did not include bridges with sufficiency ratings above 80; that is, bridges not eligible for bridge program funds.

--Illinois would have received \$22 million less in fiscal year 1980 and \$26 million less in fiscal year 1981.

--Mississippi's apportionment would have increased by about \$19 million in fiscal year 1980 and \$23 million in fiscal year 1981.

--Tennessee would have received over \$1 million less in fiscal year 1980 but about \$10 million more in fiscal year 1981.

In addition to not being current for Federal-aid bridges, the State needs used for apportionment do not include off-system bridges. Off-system bridges are an important part of the States' needs. They account for about half of all bridges in the national bridge inventory as of October 1980, and deficient off-system bridges make up about 69 percent of total deficient bridges. Including the off-system bridge data would substantially affect the amount of funds some States receive. For example, FHWA's calculation of State needs for fiscal year 1981 showed that Kansas and Minnesota had about the same amount of needs on the Federal-aid system but Kansas had off-system needs about 2-1/2 times greater than Minnesota. If updated Federal-aid and off-system needs data had been used to apportion fiscal year 1981 bridge program funds, Kansas would have received about \$5.4 million more and Minnesota about \$11.1 million less than they did, using the fiscal year 1979 apportionment factors.

According to FHWA Bridge Division officials, off-system bridges should be included in the States' overall bridge problem. Several State transportation department officials believed that the off-system bridges should have been included in the apportionments annually as they were inspected. FHWA believed that off-system bridges should not have been included until after December 31, 1980, the date when the States were to have had their off-system bridges inventoried and inspected. Fiscal year 1982 would be the first full fiscal year after December 31, 1980.

Although they are eligible for funding, we found that certain culverts ^{1/} also are not being included in the needs data used to establish the apportionments. These culverts are in the

^{1/}A culvert is a bridge constructed entirely below and not connected with the roadway surface. For example, one type of culvert is a large pipe in a stream with soil filled in around it and the roadway going over the fill.

national bridge inventory but data on their width is not. 1/ Without widths, their square footage cannot be calculated. Some controversy exists as to how the width should be measured, and FHWA has decided not to include the widths in the inventory for the reason noted in footnote 1 below.

Including these culverts would further affect apportionments but not to the same extent as including off-system bridges. According to an FHWA Bridge Division official, an earlier review indicated that the impact of not including these bridges in the apportionments was minimal. However, there are currently about 44,500 culverts without width data in the national bridge inventory, including Federal-aid and off-system bridges. As of December 31, 1980, 2,400 were deficient. Some States have many culverts of this type while other States have very few.

Some disagreement over the effectiveness
of the current allocation method

Although many State officials agreed in principle with the current method of allocating bridge funds based on the square footage of deficient bridges, some thought that the square footage of all bridges should be used. They believed that distributing funds based on deficient bridges is an incentive for the States not to maintain their bridges and use Federal funds when they need to be rehabilitated or replaced. These officials further believed that the current method discriminates against States that have fewer deficient bridges because they use their own funds for replacement and rehabilitation and provide proper maintenance. Some officials are also concerned that some States may rate their bridge conditions lower and as a result have more deficient bridges and receive more bridge program funds.

According to the bridge program's legislative history, the Congress was aware that using square footage of deficient bridges to allocate the funds could be a disincentive for the States to maintain their bridges. The Congress, however, thought it more important that the States with the greatest unsafe bridge problems receive the most funds so that the problems could be dealt with most effectively.

1/When traffic runs directly on a culvert's wearing surface or the fill is minimal and the culvert headwalls affect the traffic flow, the width is calculated for the national inventory in the same manner as a regular bridge. However, when the roadway is on a substantial fill across a pipe or box culvert and the culvert headwalls do not affect traffic flow, FHWA requires the width to be coded , zero. FHWA considers this proper inasmuch as the filled section over a culvert simply maintains the roadway cross section.

The allocation method now being used may not be the most effective for directing the most funds to the States with the largest problems. For example, the allocation is based on all deficient bridges, including those that have sufficiency ratings above 80 which do not qualify for funding. Also, no distinction is made between the condition of deficient bridges although there could be a substantial difference in the need and priority for the work and the cost to correct deficiencies.

FHWA Bridge Division officials told us they believe that the use of square footage of deficient bridges in conjunction with the use of the sufficiency rating for a breakdown into replacement and rehabilitation categories would be the best method to measure need for and allocate bridge program funds. Deficient bridges with sufficiency ratings below 50 are eligible for replacement or rehabilitation; those with ratings of 50 through 80 are eligible only for rehabilitation. Replacement generally costs more than rehabilitation, and under the Bridge Division officials' proposal, the States would receive more funds for the bridges that qualify for replacement.

An allocation method that included only bridges with sufficiency ratings less than 50 or that would give weight to the bridges' sufficiency ratings would provide even more funds to States with more of the worst bridges. FHWA considers deficient bridges with sufficiency ratings less than 50--slightly over half of all deficient bridges--to require closure or the imposition of very restrictive use if they are not replaced or rehabilitated in the near future. However, as previously stated, some State and local officials believed that this method of allocating funds is a disincentive for State and local governments to maintain and use their own funds for bridges. They believed that, in the long run, distributing the funds based on the square footage of all bridges is the best method of solving the bridge problem.

DISTRIBUTION OF FUNDS WITHIN THE STATES

The 1978 Surface Transportation Assistance Act requires that the funds provided the States are to be distributed throughout each State in a fair and equitable manner and from 15 to 35 percent is to be used on bridges off the Federal-aid system. Although some have a formal system, most States use individual project selection to distribute their apportioned funds within their respective States. The following examples illustrate some of the diversity among the States:

--Tennessee has no formal system for distributing funds. State department of transportation officials told us they attempt to select the most worthy projects and yet not ignore the needs of any section of the State. For example, if a dozen bridges needed to be replaced in the eastern part of the State and only two in the western part and Tennessee could fund only eight, those in the western part of the State would probably get funded even

if they had a slightly higher sufficiency rating. FHWA Division office officials in Tennessee told us that allocating the funds to the State's 95 counties would divide the funds too thinly.

--Distribution of funds in Pennsylvania had been based on the square footage of bridge deck--deficient and not deficient--in each of the 11 highway districts. Pennsylvania's 12-year (fiscal years 1981-92) bridge plan, however, is based on priorities established by the State with input from district and county officials. At present, the plan provides over 30 percent of the funds to the highway district that encompasses Pittsburgh. According to Pennsylvania officials, Pittsburgh area bridges are the most in need of replacement or rehabilitation. The amount of total funds the districts receive varies from about \$15.6 million in one district to about \$324.7 million for the district encompassing Pittsburgh.

--Illinois allocates 75 percent of its Highway Bridge Replacement and Rehabilitation Program funds for use on State bridges and 25 percent for local governments. For State bridges, the Illinois Department of Transportation prioritizes and selects projects with input from the State's nine highway districts. The funds are initially divided according to the number of eligible bridges in each district--a rough division of funds. The initial division is then adjusted up or down, based on a number of considerations including sufficiency ratings, traffic, and structural conditions. These adjustments between districts allow the most critical bridges statewide to be replaced/rehabilitated. Projects are programmed for work according to Illinois Department of Transportation's multiyear plan. Officials may further adjust the annual program based on factors such as the completion of engineering studies and the availability of funds and priority of needs. Minor adjustments are made to obtain a fair geographic distribution of projects.

The Illinois Department of Transportation distributes 25 percent of program funds for locally maintained bridges to highway districts based on the square footage of deficient bridges. Each district, in cooperation with the counties and municipalities, works out an annual program. Local officials participate in project selection and are aware of and monitor the allocation of funds within the district. The districts balance out their annual programs so that each local agency will eventually receive its designated portion of the funds.

Fair and equitable distribution

The major concern with regard to the 1978 Surface Transportation Assistance Act requirement for fair and equitable

distribution of bridge funds within the States is whether local governments will be treated fairly by State officials who have the authority to distribute the funds. FHWA has not defined fair and equitable and is not formally monitoring distribution within the States. Thus, FHWA does not know if the States are complying with the fair and equitable distribution requirement.

Both State and local government agencies are about equally responsible for bridges. Of the bridges in the national bridge inventory on October 31, 1980, State agencies were the custodian for about 245,000 bridges--198,000 Federal-aid and 47,000 off-system--or about 48 percent of all bridges. County, city, and other local agencies served as custodian for about 44 percent, or about 224,000 bridges--54,000 Federal-aid and 170,000 off-system. Slightly over 1 percent of the bridges were the responsibility of others, such as Federal agencies and railroad companies. (The custodian for the remaining bridges, about 7 percent, was unknown or reported with invalid custodian codes.)

Local governments are responsible for about as many bridges, but the States have the authority to distribute funds. The requirement that funds be made available throughout each State in a fair and equitable manner and also the 15- to 35-percent off-system requirement do not address the issue of how much funding for State bridges versus local government bridges.

In the States we visited, local officials were not always aware of how State officials were distributing bridge funds, but, for the most part, they believed the States were treating them fairly. We found that the States generally decided how the funds were to be distributed, but the States, to varying extents, had involved local governments in off-system project selection. For example, in Tennessee and Georgia, local governments were asked to submit a list of their top priority or worst off-system bridges. The States' highway agencies evaluated the recommendations, set the priorities, and made the final selections from among those submitted by the local governments. As previously mentioned, Illinois allocates 25 percent of its funds to the highway districts for locally maintained bridges. Each district, in cooperation with the counties and municipalities, establishes an annual program, and local officials participate in project selection.

FHWA Division Office officials told us that the State of Louisiana first interpreted off-system to mean off the Federal-aid highway system but on the State-maintained system. Under this interpretation, bridges on the parish (county) systems were not eligible for funds and the mandatory off-system funds were at first used solely for the off-system inventory and replacement of State off-system bridges. The FHWA Assistant Bridge Engineer in Louisiana told us that over a 2- to 3-year period, FHWA persuaded the State to include the parishes in the program. FHWA said that the State's attitude toward including parishes changed when a new State administration took office. The State

plans to make at least 21 percent of its fiscal year 1979-82 apportionment available to the parishes. The State decided on how the funds are to be allocated, but the parishes are allowed to establish their own priorities and select individual projects.

Some local government officials nationwide, however, have expressed concern that they are not involved enough in decisions on distributing funds and selecting projects and, as a result, may not always receive a fair and equitable share of the funds, especially for off-system bridges. In a report ^{1/} to FHWA, the National Association of Counties Research, Inc. (the research arm of the National Association of Counties) stated:

"In many states counties are totally at the mercy of their state departments of transportation where state officials, acting unilaterally, determine not only amounts of funds allocated to off-system projects (15-35 percent range) but also specific projects that are funded. State and county projects compete for the same limited available funding, but the state alone has decision-making authority * * *."

To provide that the funds apportioned to the States are made available for obligation throughout each State on a fair and equitable basis, the association recommended that:

--State and responsible local officials (those elected and directly accountable to the public they serve and who have jurisdiction over matters relating to highways and other means of transportation) jointly determine whether funds will be apportioned to the political subdivision of a State, and if sub-State apportionments are made, State and responsible local officials jointly determine the method.

--State and responsible local officials jointly select projects for funding.

Under the sponsorship of FHWA, the American Public Works Association held several seminars in 1980 primarily for city officials to explain the bridge inspection and replacement/rehabilitation programs. During the seminars, some local government officials also expressed a desire for more local participation in funds distribution and project selection.

FHWA's region 6 office conducted a survey in late 1979 of how all States were implementing the provision for fair and equitable distribution, particularly to the off-system. The results

^{1/}"Communications With County Governments," final report, June 1980.

showed that nearly all State highway agencies retained project selection control and, according to the region 6 Director, Office of Bridge, only a few States had formed fair and equitable funds distribution systems for off-system bridges. Of the systems described earlier in this chapter, only Illinois was considered to have a fair and equitable system. However, according to FHWA Bridge Division officials, most State inventories were not complete enough to formulate a basis until late in 1980.

The region 6 Director, Office of Bridge, recommended that FHWA headquarters develop a model or several models which States could follow in assuring fair and equitable distribution. The models would be viewed as guides, but the official thought their existence would apply subtle pressure on State highway agencies and that local government officials would demand highway agencies to demonstrate or develop adequate distribution plans. The FHWA Bridge Division decided against the proposal. According to Bridge Division officials, FHWA's authority and responsibility is limited to monitoring the obligation of funds statewide and discussing any noticeable inequitable State distribution of funds with the appropriate officials. However, our review of pertinent legislation indicates that the Secretary of Transportation has the authority to interpret the "fair and equitable manner" provision and to prescribe rules and regulations to ensure that the requirement is carried out.

FHWA has not defined fair and equitable distribution or established rules and regulations to carry out the provision. In the States we visited, we found that neither FHWA nor the States were formally monitoring this requirement. An FHWA division official in Georgia told us that no formal monitoring has been established because the meaning of fair and equitable distribution had never been clearly defined. Division office officials, however, told us that, although they do not formally monitor compliance, they are aware of the way funds are distributed and believe it to be correct and in compliance with the requirement's intent. However, unless fair and equitable is defined and monitored, we question whether FHWA can be sure that the requirement is being met. For example, does designating 30 percent of the funds in Pennsylvania's 12-year plan to the district that includes Pittsburgh constitute fair and equitable distribution throughout the State?

The 15- to 35-percent off-system requirement

It appears that the States are successfully complying with the 15- to 35-percent legal requirement for off-system funding. The bridge funds are divided into three accounts--the mandatory 65 percent for Federal-aid bridges, the mandatory 15 percent for off-system bridges, and an optional 20 percent that is available for either Federal-aid or off-system bridges. FHWA and State officials were using the accounts to monitor compliance.

Tennessee's plans for spending funds through fiscal year 1981 exceed the minimum 15 percent for off-system bridges. Off-system obligations at September 30, 1980, were \$8,181,075, or about 16 percent of total apportionments for fiscal years 1979 and 1980. For fiscal year 1981, Tennessee plans to spend the maximum 35 percent for off-system bridges and would like to spend more because of their bad condition. As discussed in chapter 2, over 60 percent of Tennessee's off-system bridges are deficient, and many of these are in severe condition--over 1,300 have been recommended for closure. As discussed in chapter 2, Tennessee officials estimate that it could cost in the neighborhood of \$250 million just to replace the bridges recommended for closure.

Under Pennsylvania's 12-year bridge plan, 25 percent of the funds are for off-system bridges. If the plan is implemented, the State will be in compliance with the 15- to 35-percent rule. Georgia's off-system obligations totaled \$10,524,935, or about 26.6 percent of total obligations for fiscal years 1979 and 1980. Illinois allocated about 21 percent and 18 percent to the off-system for fiscal years 1979 and 1980, respectively. Louisiana planned to make at least 21 percent of its total apportionment for fiscal years 1979-82 available for the off-system.

Some proposals have been made to eliminate entirely the requirement for bridge program funds to be used for off-system bridges. For example, the American Automobile Association believes that Federal bridge program funds should be confined to the Federal-aid highway system, and if Federal funds are to be provided for off-system bridges, the funds should not come out of the Highway Trust Fund. The association considers the low density of traffic on off-system bridges as not warranting Federal assistance unless program funds are increased. It recommends repeal of provisions of existing law mandating use of Highway Trust Funds for repair of "off-system" bridges and establishment of a funding level that will accomplish the repair or replacement of all deficient bridges on Federal-aid systems by the end of the decade.

The volume of traffic on the Federal-aid highway system is much greater than off the system. Even though local roads constitute approximately 79 percent, or 3.1 million miles, of roadway, they only carried an estimated 21 percent of total highway traffic in 1979. The Interstate Highway System alone carried about 19 percent of travel yet represents only 6 percent of the bridges and 1 percent of total mileage.

During confirmation hearings before the Senate Committee on Environment and Public Works, the new Administrator for FHWA mentioned the possibility of concentrating the bridge program on repairing inadequate bridges on the Interstate System. Others, such as representatives of the National Association of Counties, however, believe that more of the funds should be provided for off-system bridges. They recommended that a minimum of 25

percent of each State's apportionments be devoted to off-system projects with no limits on the amount the State can spend.

As stated in chapter 2, off-system bridges accounted for about 50 percent of the bridges in the national inventory as of October 1980, and these bridges generally were in worse condition than Federal-aid bridges. Many more off-system bridges were posted and closed, and about four times as many had sufficiency ratings of 50 and below. The average sufficiency rating of all off-system bridges was 59 compared to 76 for Federal-aid bridges.

The Secretary of Transportation's January 1981 report ^{1/} to the Congress on highway needs states that the condition of local roads and bridges is of special concern in rural areas where the density of highway facilities, and therefore the choice of alternate system access routes, is much lower than in urban areas. According to the report, the existence of an inferior road or bridge in these areas could effectively isolate rural residents and economic activities from the rest of the country. In some cases, school buses, service vehicles, and commercial trucks are rerouted to avoid inadequate structures, inconveniencing residents, jeopardizing the security of rural communities, and adding an element of cost to goods moved over the highway system.

CONCLUSIONS

Some State officials have expressed concern that the current method of distributing Federal bridge program funds to the States acts as a disincentive for the States to properly maintain their bridges and use their own funds for replacement or rehabilitation. They believed that using the square footage of all bridges rather than deficient bridges is the best method to allocate funds. The Congress was aware of these concerns but decided that the unsafe bridge problem was serious and that providing more funds to the States with the largest problem would be the most effective use of the funds.

Bridge program funds are being allocated to the States based on outdated and incomplete needs data. The allocations are based on 1978 calculations that have not been updated and do not include off-system bridges and some culverts. In addition, all deficient Federal-aid bridges were included regardless of whether they qualify for program funds. Furthermore, the bridges, whether they had a 0 or a 99 sufficiency rating, received equal weight in the apportionment factors even though they do not have the same need for replacement or rehabilitation and the cost to correct the deficiencies could vary substantially.

^{1/}"The Status of the Nation's Highways: Conditions and Performance," the sixth report in a series of biennial reports required by section 3, Public Law 89-139.

In keeping with the congressional intent, we believe that future bridge program legislation should require the Secretary of Transportation to annually revise the allocations to reflect current and complete needs. The needs should consist of all deficient bridges that are eligible for program funds, including deficient off-system bridges and all deficient culverts which are eligible under the program but not now included in the needs used to establish the apportionment factors. Bridges that do not qualify for the program, such as those with sufficiency ratings above 80, should be excluded from the needs calculation. More weight should be given to bridges with lower sufficiency ratings.

Although most highway traffic is on the Federal-aid system and bridge program funds are very limited, we believe that the severe off-system bridge conditions warrant continuing to provide for a portion of the funds to be used on off-system bridges. In fact, the Congress may wish to consider giving the States greater flexibility to deal with the off-system bridge problem. Off-system bridge conditions are generally worse than on the Federal-aid system. In some cases the conditions are very poor. State of Tennessee officials, for example, would have liked to provide more than 35 percent of the fiscal year 1981 bridge funds to off-system bridges because of the large number in poor condition.

State and local governments both are responsible for bridges, but bridge funds are allocated to the State governments, and the State governments have the authority to decide how the funds will be distributed between State and local government bridges. The 1978 Surface Transportation Assistance Act requires fair and equitable distribution throughout each State and a minimum of 15 percent on off-system bridges, but the act does not specifically address funding State versus local government bridges. Some local government officials have expressed concern that State officials may not adequately consider local government bridges when deciding how to distribute funds. FHWA had not defined fair and equitable and was not formally monitoring distribution within the States, which we believe should be done.

RECOMMENDATIONS TO THE CONGRESS

We recommend that the Congress:

- In future bridge program authorizations, have the Secretary of Transportation use the latest available needs data, including off-system bridges and all culverts eligible for the program, to annually revise the allocations to the States.
- Consider allowing the States greater flexibility to address severe off-system bridge problems by using more than 35 percent of the bridge funds for off-system bridges.

RECOMMENDATIONS TO THE SECRETARY
OF TRANSPORTATION

We recommend that the Secretary of Transportation direct the Administrator of FHWA to:

- Develop a reasonable method to establish width data for culverts that are eligible for bridge program funds but have not been included in the needs data used to establish funding apportionments because the width data is not in the national inventory.
- Define "fair and equitable distribution throughout the State" and formally monitor distribution of funds within the States.

FHWA COMMENTS AND OUR EVALUATION

To expedite report issuance, Senator Sasser's office directed us to obtain only FHWA's oral comments on the draft report. FHWA officials told us that their comments, as shown below and in later chapters of this report, do not necessarily represent those of the Secretary of Transportation.

Complete and current needs data

FHWA officials agreed that the latest available needs data, including Federal-aid and off-system bridges, should be used to annually revise apportionments to the States. The officials, however, did not believe that the deficient culverts without width data in the national inventory should be in the needs data. According to the officials, the culverts should not be included for the following reasons:

- If these culverts fail, only a dip in the roadway occurs, and this is not as catastrophic as a bridge collapse.
- The definition of the square footage and cost of a deficient culvert is very difficult, if not impossible, to determine.
- Only a small percentage of culverts are structurally deficient.
- The percentage or absolute number of deficient culverts is so small that including them in the needs total would not significantly affect apportionment factors.

FHWA officials told us that establishing widths for these culverts would not have a significant effect on any aspect of the program except to create more reporting and inspection requirements.

Our basic position is that if these culverts are important enough to be eligible for bridge program funding, they should be in the needs calculations. The needs data currently contains bridges of various types and deficiencies, and the majority of them are not structurally deficient and not in imminent danger of collapse.

We recognize that including these culverts would not have the same impact as including off-system bridges, but we believe that the effect would be significant for some States. FHWA data shows that there are about 44,500 of these culverts as of October 1980. About 2,400 were deficient as of December 1980. Texas, for example, had about 10,700 of the culverts and 839 were deficient. Although some States had none or very few deficient culverts, the 839 deficient culverts in Texas were more than the number of deficient bridges of all types in each of 16 States.

We further believe that including these culverts in the needs calculations would not create more reporting and inspection requirements. When calculating needs, FHWA routinely makes several adjustments in the data. FHWA could establish reasonable, if somewhat arbitrary, width data for the culverts. (The length is already available.) Using arbitrary but reasonable width data is more desirable than not including these culverts in the needs totals. We do not believe that the difficulty of establishing exact widths is sufficient reason to exclude only this type of bridge, especially if including them would make a difference in the amount of bridge funds some States receive.

Flexibility to address off-system bridge needs

FHWA officials said that they had no objection to allowing the States more flexibility to address severe off-system bridge problems by using more than 35 percent of their apportioned funds for off-system bridges. However, the officials added that it should be kept in mind that the Federal-aid system carries most of the Nation's traffic, and the current law recognizes that Federal-aid needs should have priority over off-system needs because of the relative national importance of the Federal-aid system.

We pointed out earlier in this chapter that the Federal-aid system carries most of the traffic. We agree that this would be a significant factor for the Congress to take into account. We are not necessarily recommending an overall increase in the minimum or the maximum percentage of funds for off-system bridges. However, as we also pointed out earlier, the off-system bridge needs are severe in some States, and we believe that the Congress should consider the need to allow these States to use more than 35 percent of the program funds for their off-system bridges.

Fair and equitable distribution

FHWA officials said that "fair and equitable distribution throughout each State" should be made and now that the off-system inventory is nearly complete, each State has a rational basis to formulate a "fair and equitable" system. According to FHWA officials, they have suggested that each State develop its own system that takes into account factors peculiar to each of the various States rather than establish a rigid definition of "fair and equitable distribution." The officials further stated that any FHWA definition would be so rigid that important local factors would be omitted. FHWA officials said that they plan to continue to use management reviews (see ch. 5 for a discussion of management reviews) to guide the program and promote improvements in State project selection procedures without violating the State's right to select projects.

We are not recommending that FHWA establish a rigid definition of "fair and equitable distribution" that would harm the bridge program. However, we believe that a definition is needed to guide the States in their development of distribution plans. The definition would also serve as a basis for FHWA, local governments, and others to monitor funds distribution and to question unfair distribution. Local governments are concerned about whether they will be treated fairly by State governments that are responsible for about an equal number of bridges and have the authority to unilaterally distribute program funds. We believe that local governments' participation in the program is vital and that their continued full participation requires that they view the program as creditable and fair. Furthermore, we question how FHWA can determine that the legislative requirement for fair and equitable distribution is being carried out if the term is not defined and distribution is not monitored accordingly. We believe that FHWA can establish a definition that is flexible and that provides for the States to properly address all important factors.

CHAPTER 4

FEDERAL BRIDGE PROGRAM FUNDS SHOULD BE LIMITED TO BRIDGES MOST IN NEED OF REPLACEMENT OR REHABILITATION

FHWA and State procedures for establishing priorities and selecting projects for the Federal bridge program do not ensure that bridges most in need are replaced or rehabilitated. Although many worthy projects with low sufficiency ratings are funded, some deficient bridges with high sufficiency ratings and in relatively good condition are also funded. We believe that bridge funds should be allocated to the States on the basis of more restrictive eligibility criteria that concentrate on bridges in most need of attention. Work on other deficient bridges could be funded under other Federal-aid highway, State, and local programs.

FHWA is also selecting some bridges for discretionary funding that have high sufficiency ratings, primarily because it is giving priority to bridges that have "legislative history;" that is, bridges that have been suggested as candidates for discretionary funding in a congressional committee report or in the Congressional Record. Many bridges are eligible and more bridges are being given legislative history. We believe that FHWA should develop a formal method of selecting bridges based on factors such as sufficiency ratings, costs, and benefits.

PRIORITIZING AND PROJECT SELECTION RESPONSIBILITIES ARE DIVIDED

As pointed out in chapter 1, FHWA is required to classify bridges according to their serviceability, safety, and essentiality for public use and assign each a priority for replacement or rehabilitation. FHWA is also responsible for determining which bridges are eligible to be replaced or rehabilitated with Federal bridge program funds. The 1978 Surface Transportation Assistance Act provides that bridges can be replaced or rehabilitated under the program when the States and FHWA determine that they are important and unsafe because of structural deficiencies, physical deterioration, or functional obsolescence.

The States select the bridges to be replaced or rehabilitated with the bridge funds that are apportioned to them. FHWA generally approves the States' selections if the selected bridges are eligible according to its criteria and if the States have available bridge funds. FHWA cannot legally interfere in the States' project selection as long as the States select from among eligible bridges.

FHWA selects the bridges for discretionary funding, subject to the Secretary of Transportation's final approval. FHWA can select from among the deficient bridges nationwide that meet the 1978 Surface Transportation Assistance Act criteria that their replacement or rehabilitation cost more than \$10 million or twice the respective States' fiscal year apportionment.

FHWA's PROJECT ELIGIBILITY CRITERIA
ARE LOOSE

FHWA's project eligibility criteria is not restrictive enough to concentrate on bridges most in need of replacement or rehabilitation. FHWA has established two requirements that a bridge must meet to be eligible for the bridge program. First, it must be deficient--either structurally deficient or functionally obsolete. Second, it must have a sufficiency rating of 80 or less. Deficient bridges with sufficiency ratings less than 50 qualify for replacement or rehabilitation, and those with ratings of 50 through 80 can only be rehabilitated.

Sufficiency ratings are a means to put various deficiencies and safety conditions into perspective and identify bridges most in need of replacement or rehabilitation. Bridge program regulations 1/ require that the ratings be used as "a basis for establishing eligibility and priority for replacement or rehabilitation of bridges; in general, the lower the rating, the higher the priority."

Following is a discussion of the adequacy of the formula used to calculate sufficiency ratings, FHWA's definition of a deficient bridge, and the range of sufficiency ratings used to establish eligibility.

Adequacy of the sufficiency rating formula

As previously mentioned, sufficiency ratings are numerical ratings from 0 to 100 percent designed to reflect priority for replacement or rehabilitation. The lower the rating, the higher the priority. The sufficiency rating formula is a method used to evaluate factors indicating the sufficiency of a bridge to remain in service in its present condition. A rating of 100 percent would represent an entirely sufficient bridge--one that needs absolutely no work--and a 0-percent rating would indicate an entirely insufficient or deficient bridge--one that has had a high volume of average daily traffic but has many safety problems and should be closed.

Sufficiency ratings may be misleading to outsiders who tend to view the ratings solely as a measure of structural condition

1/Code of Federal Regulations 23 Highways - Part 650.

and who would expect a bridge rated at 40, for example, to be twice as sound as a bridge rated at 20. As shown below, structural adequacy accounts for slightly over half of the sufficiency rating formula and, as a result, sufficiency ratings do not directly reflect structural soundness. Two bridges in the same structural condition may have substantially different ratings because of differences in the other factors. The formula has three general categories that are assigned relative weights as follows:

Structural adequacy and safety	55 percent
Serviceability and functional obsolescence	30 percent
Essentiality for public use	15 percent

Each category is comprised of several safety features or prioritizing considerations. Structural adequacy and safety are made up of the superstructure, substructure--or culvert and retaining walls for culverts--and the inventory rating.^{1/} The average daily traffic, the detour length if the bridge is closed, and whether the bridge is on a defense highway indicate the essentiality for public use. Serviceability and functional obsolescence are made up of items such as approach roadway alignment, underclearances, deck conditions, average daily traffic, deck geometry, and number of lanes. If the sufficiency ratings are 50 or above, the formula also provides for an additional special reduction up to 13 percent for long detour lengths, guardrails and bridge railings that do not meet current standards, and structure types such as suspension and movable bridges. Some bridges that would not ordinarily qualify for replacement would if one of these special considerations applied.

Within each category, the various items are also weighted. For example, the sufficiency rating of a bridge whose substructure is critically weak would be reduced the maximum 55 percent. If the substructure was in marginal condition, 25 percent would be subtracted. No points would be subtracted if the substructure was in fair condition. Another example is deck geometry. If somewhat better than minimally adequate, the rating would be lowered by 1 percent. If the deck geometry was basically intolerable, 4 percent would be subtracted. Also, a bridge may be in the same condition as another but have a lower rating because of a higher volume of average daily traffic. A bridge's rating can be reduced up to 15 percent based on its average traffic.

^{1/}A capacity rating that reflects the load level which can safely use the bridge for an indefinite period.

The formula has been widely reviewed and accepted

FHWA developed the original formula and implemented it in 1972. After the formula received substantial criticism, FHWA asked the AASHTO Technical Committee on Bridge Replacement Surveys and Inspection Standards to review the formula and suggest modifications. The AASHTO committee, working directly with FHWA, revised the formula and sent it to all the States for vote in 1976. Forty-four States approved the committee's proposed changes; 1 State abstained; and 5 States voted against it. According to FHWA Bridge Division officials, FHWA adopted AASHTO's proposed revisions in 1977, and no other changes have been made in the formula. In addition, the formula was described in the proposed regulations for the Highway Bridge Replacement and Rehabilitation Program that were published in the Federal Register for comment. FHWA received no substantial objection to the formula.

During our review, we discussed the adequacy of the formula with numerous Federal, State, and local officials and others such as representatives of the National Association of Counties. They generally approved of the formula and considered it to be adequate. According to the officials, however, projects should not be selected solely on the basis of their sufficiency ratings. The officials believed that project selection can best be made at the State and local levels and selecting officials need flexibility to also consider other factors, such as economic impact, accident data, and whether the bridge is on a schoolbus route. Some officials said that in some cases they may place more emphasis on average daily traffic, functional obsolescence, or structural adequacy than the sufficiency formula does.

Although many agree with the sufficiency formula, there is some debate over whether structural adequacy or functional obsolescence should receive the most weight in the formula. In fact, arguments over which type of problem should receive the higher priority have been going on even before the start of the bridge program. Proponents of higher priority for functional obsolescence point to the accidents and deaths on narrow and poorly aligned bridges. Those favoring higher priority for structural adequacy refer to the potential for major catastrophe when bridges collapse and the impact of posted and closed bridges.

FHWA believes that the Congress intended for structurally deficient bridges to receive higher priority. For example, during the congressional debates on the Surface Transportation Assistance Act, the Congress decided that the States would continue to have flexibility in selecting projects, but a hope was expressed that the States would attend to the more serious "safety problems" (structurally deficient bridges) before functionally obsolescent problems. As discussed earlier in this chapter, the sufficiency formula gives almost twice as much weight to structural adequacy and safety as it does to serviceability and functional obsolescence.

FHWA broadly defines a deficient bridge

FHWA defines "deficient" to include a variety of bridge inadequacies and conditions. (A detailed explanation of the definition is contained in app. II.) The type and degree of deficiency can vary widely from one deficient bridge to another, and the safety impact can also differ. FHWA considers all deficient bridges to be unsafe, but to varying degrees. The manner in which FHWA defines deficient is important because, as mentioned earlier in this chapter, a bridge must be deficient according to FHWA's definition to be eligible for the bridge program (it must also have a sufficiency rating of 80 or less). FHWA considers a bridge structurally deficient if either its deck, superstructure, or substructure (or culvert and retaining walls for culverts)--the major sections of a bridge--has deteriorated or has weakened to the point that it has been given a rating of four or less on a scale of zero to nine by State or local government inspectors. A "four" condition rating indicates "marginal condition--potential exists for major rehabilitation." A zero rating, the lowest level, denotes that the bridge is in critical condition, beyond repair, and is closed to traffic. A bridge is also structurally deficient if its overall structural condition or waterway adequacy has an appraisal rating of two or less. An appraisal rating of two indicates basically intolerable conditions requiring high priority of replacement. A "zero" rating means immediate replacement is necessary for the bridge to be put back in service.

A bridge is functionally obsolete if its deck geometry, underclearances, or approach roadway alignment has an appraisal rating of three or less, or its overall structural condition or waterway adequacy is rated as a three. A "three" rating indicates a basically intolerable condition requiring high priority repair, which, according to FHWA, means that a bridge is functionally obsolete and can no longer fully and safely service traffic.

All deficient bridges are not unsafe to the same degree and are not in the same need of replacement or rehabilitation. For example, a concrete-deck bridge can be structurally deficient if at least 40 percent of its deck is contaminated with chloride (salt). Although this contamination is a concern and, if not corrected, can eventually result in extreme deck deterioration, the bridge does not pose an immediate safety problem. The situation is not as critical as a bridge deck that has holes and other sections that are in danger of failing. Nor does deck contamination present the same safety problem as a critically weak substructure. An FHWA Division Office official in Tennessee told us that almost any bridge in Tennessee on a well-traveled road (one that would receive much salt in the winter) and at least 6 to 10 years old would qualify as deficient if its deck were examined carefully for deterioration. A further example is a bridge that is deficient (functionally obsolete) because it is not properly aligned with its roadway. According to FHWA,

a bridge that is deficient for this reason only would rarely, if ever, be replaced.

The manner in which FHWA defines deficient makes a difference in the number of deficient bridges and what type of bridges are eligible for Federal bridge program funds. For example, in December 1978 FHWA changed its definition of structurally deficient to include the deck as a feature that could make a bridge deficient and by raising the condition rating needed to qualify as deficient from a "three" to a "four" for the superstructure and substructure, the same as for the deck. FHWA changed its definition to make bridges eligible for bridge program funds whose structural condition, primarily the deck, had deteriorated but not to the point that replacement was needed. The objective was to rehabilitate appropriate bridges before more costly replacement became necessary. FHWA officials told us that the definition change resulted in an increase of about 7,000 deficient bridges at the time the revision was made.

We applied the old and new definitions to the national bridge inventory data as of October 31, 1980. This analysis showed that the number of structurally deficient bridges increased from about 62,000 under the old definition to about 98,000 under the new definition, an increase of 36,000 bridges, or about 60 percent. The total number of deficient--structurally deficient and functionally obsolete--bridges is 22 percent greater using the revised rather than the old definition.

Nearly all deficient bridges are eligible
for Federal bridge program funding

About 95 percent of all deficient bridges are now eligible to be replaced and/or rehabilitated under the Federal bridge program. About 60 percent have sufficiency ratings below 50 and thus qualify for replacement or rehabilitation. About 35 percent have ratings of 50 through 80 and generally are eligible for rehabilitation only. FHWA has approved the replacement of some bridges with ratings of 50 through 80 at the request of the States. For example, the State of Georgia wanted to improve some timber bridges, and cost comparisons of rehabilitation versus replacement showed that it would be more beneficial in the long run to replace them with bridges of a different type of material.

Rehabilitation is generally less expensive than replacement because part of the bridge is left in place. During rehabilitation all major defects are to be corrected and the bridge's life is to be extended, but this work is done without replacing the whole bridge. For example, only the deck may be replaced or the bridge widened with much of the bridge left as it is.

Before December 1978, FHWA limited eligibility to bridges with ratings below 50. FHWA raised the criteria to 80 in conjunction with its change in the definition of a deficient bridge discussed earlier in this chapter. These changes in the

eligibility criteria were made primarily to permit use of bridge program funds for deficient deck rehabilitation in recognition of the large deficient deck problem. FHWA had previously estimated that it would cost over \$6 billion to restore the surfaces of bridges on the Federal-aid system. Some FHWA field personnel have expressed concern over the need to rehabilitate decks on bridges with a sufficiency rating of 50 through 80 and recommended that use of the funds for deck rehabilitation not be allowed. FHWA, however, believes that the deck problem warrants using the funds for this purpose, and the deck rehabilitation work is to also correct any major safety defects as well as significantly extend the bridge's service life.

The eligibility changes were also made to give greater emphasis to rehabilitating bridges before their condition deteriorates to the point that they need replacing. FHWA officials believe that the bridge funds would be more effective if rehabilitation that would extend the service life of the bridges corrected problems at less cost before they become major and more expensive replacement or rehabilitation is required.

According to FHWA Bridge Division officials, FHWA selected 80 as the eligibility cutoff based on a review of bridges that needed rehabilitation, including deck work, but did not previously qualify for funding because their sufficiency ratings were 50 or above. The review showed that many bridges needing deck and similar rehabilitation but no major safety problems had sufficiency ratings in the 70's.

The change in eligibility criteria has a large impact on the number of types of bridges that are eligible for the bridge program. About one-third of the bridges that are now eligible for bridge program funds would not have been eligible previously. Under the current criteria, many bridges with inadequate deck conditions but no other major deficiency are now eligible, and many more functionally obsolete (primarily narrow) bridges are also eligible.

PROJECT SELECTION BY THE STATES

The States use various methods to select bridge projects for funding. Some have selected projects on a first-come, first-serve basis while others considered a variety of factors. The States generally use the sufficiency ratings to identify eligible projects and as one of the factors in project selection. The amount of weight given sufficiency ratings varies. Examples of the various factors the States consider are:

--In Pennsylvania, State officials told us that, in addition to sufficiency ratings, factors such as Public Utility Commission 1/ orders, effects on industry and commerce, access for police and firefighters, and type of bridge traffic are considered when bridges are ranked and selected for funding. They said they put more emphasis on traffic flow than the sufficiency formula does.

--In Georgia, factors currently considered by the State include sufficiency ratings, average daily traffic, school-bus routes, bridge structural condition and project cost effectiveness, continuity of the route, future potential for an increase in the volume of traffic, continued maintenance costs, and the number of injuries or fatalities. Georgia is establishing a formal priority system which modifies the above factors and provides primary focus on the level of service and risk to the public. The system, which is to be used along with sufficiency ratings, was scheduled to be fully implemented on June 30, 1981, and was being used as a guide by the district offices. It proposes to rank all bridges in the State in numerical sequence and by State- and county-owned bridges. However, projects will not be selected strictly in numerical order. The Georgia Department of Transportation will examine in more detail a certain number of bridges and then make its selections. For example, it may decide to select bridge projects in 1982 from among the 500 bridges the system identifies as most needy.

--Illinois Department of Transportation officials told us that they try to use Federal bridge program funds to work on their worst bridges, and they concentrate on deficient bridges with sufficiency ratings below 50. Other factors, such as location, average daily traffic, availability of matching funds, completeness of design plans and economic effects, are also considered.

--In Tennessee, State officials said they most recently selected projects from a listing of bridges that had sufficiency ratings of 50 or less and that had superstructure or substructure ratings of 3 or less or a load-carrying capacity of 10 tons or less. For county off-system projects, the listing contained bridges with sufficiency ratings of 50 or less and a load-carrying capacity of 3 tons or less. Under the National Bridge Inspection Standards,

1/An independent State commission responsible for regulating utilities in the State, including railroad companies. The commission has authority over maintenance and repair of facilities, and it can order a highway bridge over a railroad track to be repaired or replaced.

3 tons is the minimum load capacity for a bridge to remain open to traffic. Projects were selected from the listings after State officials considered factors such as structural condition, average daily traffic, and detour length. The need to provide broad geographical distribution, whether local governments could provide matching funds, and traffic disruption are also taken into account. State of Tennessee officials required the local governments to provide the 20-percent non-Federal share of the project cost. In some cases, bridges would have been selected by State officials but the local governments could not provide the matching funds.

--In Louisiana, a Department of Transportation and Development official told us that bridges with the lowest sufficiency ratings are selected as much as possible. The official said the State concentrates on projects with sufficiency ratings below 50, but in some cases bridges with higher ratings are selected when they are part of a series of low-sufficiency rating bridges on the same span of highway or when average daily traffic is high.

The State had allocated \$27 million in Federal bridge program funds to its 64 parishes--about \$420,000 to each parish--and individual parishes were allowed to select off-system bridges. Officials of two parishes told us that they select projects with the lowest sufficiency ratings but with consideration given to schoolbus routes. Another parish considers usage and bridges identified as having no remaining useful life. Another parish takes into account sufficiency ratings, traffic count, and whether the bridges are on schoolbus routes.

Profile of projects selected for Federal bridge program funding

The States apparently are not always selecting bridges in the worst condition or most in need. Although many selected bridges had very low sufficiency ratings, some bridge ratings were relatively high. The following table shows the range of sufficiency ratings of bridges approved for funding in 10 States from the beginning of the bridge program through December 1980. (In Nov. 1978 the States were first permitted to select bridges with sufficiency ratings from 50 through 80.)

<u>State</u>	Total number of bridges	Range of sufficiency ratings				
		Less than <u>20</u>	20.0 to <u>39.9</u>	40.0 to <u>49.9</u>	50.0 to <u>59.9</u>	60 and above
(number of bridges selected -----for bridge program funding)-----						
Calif.	181	79	43	51	6	2
Ga.	345	140	93	51	27	34
Ill.	819	373	374	63	4	5
Kans.	265	114	91	27	9	24
La.	179	68	58	32	11	10
Mass.	42	9	21	1	3	8
N.Y.	287	98	114	47	19	9
Pa.	80	49	17	9	2	3
Tenn.	314	134	114	39	5	22
Wyo.	32	3	18	6	2	3
Total	<u>2,544</u>	<u>1,067</u>	<u>943</u>	<u>326</u>	<u>88</u>	<u>120</u>

About 58 percent of the approved bridges had sufficiency ratings of 20 or higher, and about 21 percent had ratings of 40 or higher. The range of ratings, however, varied by State. About 33 percent of the California and Georgia bridges had ratings of 40 or higher compared to about 9 percent for Illinois. Of the approved bridges, 85 percent were structurally deficient and 93 percent were to be replaced rather than rehabilitated.

Deficient bridges with low sufficiency ratings are usually available for selection. For example, in October 1980, the national bridge inventory contained over 26,000 deficient bridges with sufficiency ratings of 20 or below. About 87,000 had ratings from 20.1 through 50.0. About 63 percent of the Nation's deficient bridges had ratings of 50 or less. The following table shows the above 10 States' number of deficient Federal-aid and off-system bridges with sufficiency ratings from 0.0 through 20.0 and from 20.1 through 50.0 in October 1980.

Number of Deficient Bridges with Sufficiency
Ratings of 50 or Below
as of October 1980

State	00.0-20.0		20.1-50.0	
	Federal-aid	Off-system	Federal-aid	Off-system
Calif.	171	279	537	763
Ga.	141	1,879	329	1,750
Ill.	265	2,118	707	2,802
Kans.	178	1,064	517	4,019
La.	162	111	444	484
Mass.	21	5	56	12
N.Y.	198	839	989	2,911
Pa.	225	567	393	974
Tenn.	228	691	736	1,036
Wyo.	6	4	63	21
Total	<u>1,595</u>	<u>7,557</u>	<u>4,771</u>	<u>14,772</u>

In two States that had a number of approved projects with relatively high sufficiency ratings--Georgia and Tennessee--we examined the projects in more detail. We selected at random nine Georgia projects with high sufficiency ratings. Three bridges--sufficiency ratings of 66.1, 75.5, and 79.5, respectively--were selected and approved for rehabilitation or replacement because they were on the routes of ongoing roadway projects. The State used Federal, State, and county highway funds to improve the roadway between the bridges and Federal bridge program funds to widen the bridges. Two of these bridges were on the Federal-aid highway system, and the State could have used Federal-aid and/or State highway funds for them.

Of the remaining six projects, three bridges--sufficiency ratings of 57.1, 63.6, and 73.1--were among those recommended by local governments as most in need of work. All three of these bridges were initially approved for rehabilitation; however, one bridge (sufficiency rating 63.6) was ultimately replaced because Georgia Department of Transportation officials determined, and FHWA concurred, that it was more cost efficient to replace this timber structure. The remaining three bridges--sufficiency ratings 43.9, 60.4, and 64.5--were approved for a variety of reasons. One bridge (sufficiency rating 43.9) was approved for replacement due to frequent flooding problems. One bridge (sufficiency rating 60.4) was approved for rehabilitation (widening) because of expected increases in traffic volume resulting from improvements to Interstate 75. Finally, one bridge (sufficiency rating 64.5) was approved for rehabilitation (widening) in part because of expected increases in traffic volume and its location on a school-bus route. Georgia officials said that funding some projects with relatively high sufficiency ratings did not adversely affect the State's priority system. They said that road improvement

projects are initiated primarily to reduce hazards caused by high-volume traffic, narrow widths, etc., which are also factors considered in prioritizing bridges.

Generally, Tennessee has selected projects by using the system previously described in this chapter, with some exceptions. According to State officials, these exceptions usually have been made because the bridges were eligible and were ready for funding when other projects identified by the usual selection procedures were not. The State had identified the work as needed and planned to fund the projects with Federal-aid, State, or bridge program funds. State officials decided to proceed with obligating funds for the projects that were ready rather than take a chance that unobligated funds might be lost.

Several of the projects involved rehabilitating Interstate bridges and were often qualified for bridge funds because of deck deterioration identified through more extensive deck examination than is usually done during inspections. State officials said these projects were usually developed in conjunction with other work already being done for upgrading part of a route or were developed in conjunction with a safety project. In many cases the State decided to perform the bridge work at the same time as the other work to disrupt traffic flow as little as possible. Often funds from the bridge program were used for only part of the work done at these bridges and were supplemented with other moneys such as Federal safety funds or regular Interstate funds.

Although these bridges had considerably higher sufficiency ratings than many Tennessee bridges, State officials believed that the work had to be done and that FHWA had made it easier to qualify bridges because of poor decks as a means of encouraging this type of work. Therefore, they took advantage of this as an additional source of funding. Tennessee officials agreed that using program funds for these types of projects might be questionable when so many bridges in very poor condition cannot be funded at this time. However, State officials said that they liked the flexibility to fund these projects and the work is needed.

We determined the sufficiency ratings at the time of project approval for those Tennessee bridges that actually received bridge program funds for construction work in 1979. This data is summarized in the following table.

Range of Sufficiency Ratings for Tennessee Bridges
Funded for Construction Under the Bridge
Program in Fiscal Year 1979

<u>Sufficiency rating</u>	<u>Replacement</u>	<u>Rehabilitation</u>	<u>Total</u>
----- (number of bridges) -----			
0.0-20.0	6	1	7
20.1-50.0	13	0	13
50.1-80.0	<u>1</u>	<u>16</u>	<u>17</u>
Total bridges	<u>20</u>	<u>17</u>	<u>37</u>
Average sufficiency rating	31.2	63.4	46.0

As shown above, almost half of the bridges had sufficiency ratings above 50. Many other Tennessee bridges were in worse condition. Tennessee officials, however, said that the above table is somewhat misleading because only a small part of the bridge program funds obligated in fiscal year 1979 for the bridges is for those with sufficiency ratings above 50. The officials provided the following information.

Funds Obligated for Construction Projects in 1979 by Sufficiency Rating

<u>Sufficiency rating</u>	<u>Bridge funds obligated (note a)</u>	<u>Percent of total</u>
0.0-20.0	b/ \$2,587,873	20.2
20.1-50.0	9,888,156	77.3
50.1-80.0	310,198	2.5

a/Based on initial contract amounts.

b/Includes three bridges with higher ratings (two below 50 and one at 64.4) which were part of a larger project that involved bridges with sufficiency ratings that were below 20.0.

FHWA Bridge Division officials told us that they have encouraged the States to select bridges with lower sufficiency ratings but the States may select any eligible bridge. The officials said that FHWA cannot legally interfere with the States' project selection decisions and many factors, some unique to an individual State, enter into the State's selection process. According to the officials, it is "not practical or possible to collect all of this unique data" in the sufficiency rating formula.

BETTER PROJECT SELECTION METHOD
NEEDED FOR DISCRETIONARY FUNDS

FHWA is responsible for selecting projects for discretionary funding, but its current method of selecting projects needs to be improved. Under the bridge program, \$200 million of each year's authorization is used at the discretion of the Secretary of Transportation for replacing or rehabilitating bridges with a project cost that is twice a State's annual apportionment or more than \$10 million, whichever is less.

FHWA's Highway Bridge Replacement and Rehabilitation Program Implementation Plan calls for FHWA to select bridges using sufficiency ratings and legislative history. Sufficiency ratings, however, have been only a small factor in the selection process. Bridges with legislative history receive top priority and are selected first. According to an FHWA Bridge Division official, a review of legislative history for the Surface Transportation Assistance Act indicated to FHWA that bridges designated by the Congress should have high priority. FHWA has determined that a bridge has legislative history if its replacement or rehabilitation is required by legislation, it is mentioned in congressional conferences or committee reports, or it is mentioned in the Congressional Record. For example, the Florence Bridge in Illinois was mentioned in the Congressional Record of September 28, 1978.

"There are thousands of examples of bridges which would be covered by the funding under this section of the legislation. One of these is the existing Florence Bridge [which] is located on a heavily traveled Federal-aid primary route connecting central and western Illinois. The entire existing highway route is inadequate to meet traffic demands and is being replaced with a new facility. As part of this project, the bridge at Florence spanning the Illinois River must be replaced. It is both structurally deficient and functionally obsolete."

The bridge's sufficiency rating at the time of funding was 45.9.

FHWA selected 10 more bridges based on language in an August 11, 1978, House Committee on Public Works and Transportation report on the proposed Surface Transportation Assistance Act of 1978. The report stated that:

"Discretionary funds provided for in this Bill should be used for major crossings, assigning the highest priority to structures such as the Queensborough and Manhattan Bridges in New York City, the Cochrane Bridge on Alternate U.S. 90 over the Mobile River in Alabama, the Golden Gate Bridge between San Francisco and Marin County, California, the U.S. route 84 bridge

crossing over the Mississippi River between Natchez, Mississippi, and Vidalia, Louisiana, the Scott County-Hennepin County Highway 18 Bridge (Bloomington Ferry Bridge) in the vicinity of Bloomington, Minnesota, the U.S. Grant Bridge crossing the Ohio River in the vicinity of Portsmouth, Ohio, the Fore River Bridge in Quincy, Massachusetts, the South Park Bridge between Katherine and Elk Streets in Buffalo, New York, the bridge crossing the Mississippi River at Quincy, Illinois, the Eagle Point Bridge in Dubuque, Iowa, and the Center Street Bridge between Willamina and Salem, Oregon * * *."

FHWA has not provided discretionary funds for the Bloomington Ferry Bridge because section 149 of the 1978 Surface Transportation Assistance Act authorized \$200,000 for an environmental impact study of its reconstruction. The U.S. Grant Bridge is being funded as one of the projects to demonstrate accelerated bridge replacement or reconstruction.

FHWA selects other bridges without legislative history if funds are available. According to FHWA officials, each of these projects is reviewed and evaluated on its individual merit. Such factors as duration of construction period, cost, sufficiency rating, and immediacy of need are considered to make final selections. FHWA also attempts to spread selection around to as many States as practicable.

Beginning in fiscal year 1980, only bridges with legislative history are funded for all phases, starting with preliminary engineering through construction. Bridges with no legislative history must have the preliminary engineering completed and the bridges ready to begin construction. According to an FHWA official, the desire to fund preliminary engineering only for the bridges having legislative history was based on the program's planning schedules, which indicated that if funds were continued for preliminary engineering of all projects, construction funds would not be available to complete the projects when they were ready to go to contract. States are encouraged to use regular apportioned funds for all program phases through preliminary engineering.

Through fiscal year 1981, 45 bridge projects in 30 States were approved for discretionary funding. The following table gives by State the number of projects approved and the cumulative total of discretionary funds allocated for fiscal years 1979-81.

Number of Projects Approved for Discretionary Funding
and Cumulative Total of Funds Allocated
by State for Fiscal Years 1979-81

<u>State</u>	<u>Number of projects</u>	<u>Cumulative amount</u>
		(millions)
Ala.	1	\$ 3.3
Alaska	1	20.7
Calif.	2	23.5
Del.	1	6.5
Fla.	1	10.0
Ga.	1	1.6
Idaho	1	9.6
Ill.	3	46.9
Iowa	1	36.4
Kans.	<u>a/</u>	11.5
Maine	2	7.0
Md.	1	17.4
Mass.	1	2.6
Mich.	1	1.8
Minn.	<u>b/</u>	6.7
Miss.	1	9.7
Mo.	2	32.4
Nebr.	<u>c/</u>	2.5
N.Y.	4	34.0
N.D.	1	1.1
Ohio	1	25.9
Oreg.	1	23.4
Pa.	3	60.4
R.I.	1	3.0
S.C.	3	37.3
Tex.	1	8.4
Vt.	<u>d/</u>	.2
Va.	2	28.8
Wash.	3	74.2
Wis.	<u>e/</u>	<u>52.2</u>
 Total	 <u>45</u>	 <u>\$599.0</u>

a/Joint bridge with Mo.

b/Joint bridge with Wis.

c/Joint bridge with Iowa.

d/Joint bridge with N.Y.

e/Joint bridge with Iowa.

Twenty-seven of these projects had legislative history, and 18 did not. The total estimated cost for all the projects is \$1.79 billion, of which \$1.3 billion is the Federal share.

As shown below, about three-fourths of these projects are structurally deficient and over 90 percent of them will be replaced.

	<u>Number of projects</u>	<u>Number being replaced</u>	<u>Number being rehabilitated</u>
Structurally deficient	34	31	3
Functionally obsolete	<u>11</u>	<u>10</u>	<u>1</u>
Total	<u>45</u>	<u>41</u>	<u>4</u>

The following table shows the range of sufficiency ratings at the time of funding of the bridges approved for discretionary funding.

<u>Range of sufficiency ratings</u>	<u>Number of projects</u>
60.0 and above	2
50.0 to 59.9	3
40.0 to 49.9	5
20.0 to 39.9	16
Less than 20.0	<u>19</u>
Total	<u>45</u>

Many other projects have been eligible for discretionary funds but have not been selected because of a shortage of funds. About 110 bridges, with estimated costs totaling \$2.5 billion, were initially submitted to FHWA for consideration for funding in fiscal year 1979. As of December 1980, the States had submitted a total of 192 bridges with total estimated project costs of \$5.3 billion, of which \$4.1 billion would be the Federal share. Thirty-one projects were selected for funding in fiscal year 1979, and an additional 11 projects were selected for fiscal year 1980. In fiscal year 1981, FHWA considered 50 projects other than those previously funded in fiscal years 1979 and 1980 as being available for discretionary funding. All these were ready for construction or had legislative history. Not enough funds were available to fund all projects; therefore, in addition to projects previously selected during prior fiscal years, only three projects that had legislative history were selected for fiscal year 1981 funding.

An example of an eligible bridge that has not been selected for funding is the Walnut Street Bridge in Chattanooga, Tennessee. The bridge is closed to all traffic, and it is the State's highest priority for discretionary funds. The bridge had an

average daily traffic volume of about 9,150. The estimated cost to replace it has escalated from \$19.3 million in January 1979 when the initial request was submitted to FHWA to \$35.8 as of February 1981. The increase in cost is due to a better estimate based on more detailed information and the escalation of bridge construction cost.

In January 1979 Tennessee requested \$320,000 in fiscal year 1979 discretionary funds for preliminary engineering work and right-of-way acquisition on this bridge. According to FHWA, the request was denied because the bridge did not have legislative history and bridges without legislative history cannot receive funds for preliminary engineering and right-of-way acquisition. In September 1980 Tennessee requested \$2.16 million for right-of-way acquisition. The bridge was not selected for discretionary funding in fiscal year 1981.

Preliminary engineering work on the Walnut Street Bridge is now underway. Funding to date has been partially on a 50-50 sharing basis between the State and local government and more recently on an 80-20 basis using apportioned bridge funds. Tennessee officials hope that the bridge will be selected for discretionary funding when it is ready for construction to begin.

At the time of their selection, many bridges that FHWA approved for discretionary funding had much higher sufficiency ratings than the Walnut Street Bridge's 13.7. The following are several examples of these approved bridges with relatively high sufficiency ratings.

<u>Bridge name</u>	<u>Location</u>	Sufficiency rating at the time of selection
Pekin (Route 9) Bridge*	Ill.	67.2
Golden Gate Bridge	Calif.	61.0
Eagle Point Bridge	Iowa	58.6
James Island Bridge	S.C.	54.5
Natchez-Vidalia Bridge	Miss.	54.0
Keokuk Bridge	Iowa	48.8
U.S. 36 Bridge at Florence	Ill.	45.9
Swinomish Ch. Bridge*	Wash.	45.6
Torras Causeway	Ga.	45.6
Brazos River Diversion Ch. Bridge*	Tex.	43.6
Sampit River Bridge	S.C.	39.0

* Denotes projects without legislative history.

Several other eligible bridges that were not selected had sufficiency ratings lower than the Walnut Street Bridge. For example, of the 50 projects considered for fiscal year 1981 discretionary funding, 16 had sufficiency ratings of 10 or below.

The following table lists these projects and their sufficiency rating.

<u>Bridge name</u>	<u>Location</u>	Sufficiency rating
Rte. 22 W.B./Waverly Yards	N.J.	10.0
Pulaski Skyway	N.J.	7.0
Rte. 152/ Broad Thorofare	N.J.	6.0
Penrose Avenue Bridge	Pa.	6.0
Williamsburg	N.Y.	5.0
N.C. Rte. 32/Albemarle Sound	N.C.	4.0
U.S. 54/Grande Glaise Arm of Lake Ozark	Mo.	4.0
Bonners Ferry Bridge (note a)	Idaho	2.6
Liberty Bridge	Pa.	2.0
Westinghouse	Pa.	2.0
Minsi Trail Bridge	Pa.	2.0
Rte. 93/Susquehanna R. at Berwick	Pa.	2.0
S.R. 63 Bridge/Escatawpa River	Miss.	2.0
Clark Avenue Bridges	Ohio	2.0
S.R. 18/Lewes-Rehoboth Canal	Del.	2.0
Stephens St. Bridge at Lamont	Ill.	0.0

a/Project recently received legislative history as a result of a Sept. 9, 1980, Committee on Appropriations report on the proposed Department of Transportation and Related Agencies Appropriation Bill, 1981.

Although the James Island Bridge, Rousse's Point Bridge, and Bismarck Memorial Bridge selected in fiscal year 1981 had a legislative history, their sufficiency ratings were 54.5, 32.1, and 32.0, respectively.

The State of Tennessee's Chief Engineer for Structures (bridges) told us he believes that discretionary bridge funds first should be allocated to replace or rehabilitate bridges in the worst condition. According to this official, if sufficiency ratings are the criterion being used to indicate bridge conditions, then those bridges with the lowest sufficiency ratings should be funded first. The official told us that replacing or rehabilitating the State's large, high-cost bridges is its largest bridge problem. Tennessee has 23 deficient bridges eligible for discretionary funding as of July 1980 at an estimated replacement cost of approximately \$490 million. Tennessee's bridge fund allocation under the Highway Bridge Replacement Rehabilitation Program for fiscal years 1979-81 is about \$81.4 million.

CONCLUSIONS

FHWA's project eligibility criteria for the Federal bridge program are not restrictive enough to concentrate on bridges most in need of replacement or rehabilitation. The two major aspects of the criteria are how FHWA defines a deficient bridge and the range of sufficiency ratings that FHWA has established to qualify deficient bridges as eligible. FHWA's definition of deficient includes bridge inadequacies and conditions that can vary widely from bridge to bridge. The safety impact and the priority for replacement or rehabilitation can also vary widely. The range of sufficiency ratings that qualify deficient bridges as eligible is also broad--from 0 through 80 on a scale of 0 through 100. As a result, nearly all deficient bridges are eligible for replacement and/or rehabilitation even though some deficiencies are relatively minor.

The States are selecting many worthy bridges to be replaced or rehabilitated with bridge program funds. About 42 percent of the selected bridges in 10 States had sufficiency ratings less than 20. Nonetheless, some bridges with high sufficiency ratings are selected. About 21 percent of the selected bridges in these States had ratings of 40 or above.

Although the work on bridges with higher sufficiency ratings may be needed, the question arises as to whether the bridge program funds should be used for these bridges or for bridges in the worst condition and in the most need of replacement or rehabilitation. Other Federal-aid highway or State and local funds could be used for the work on bridges with high ratings.

We believe project selection for the bridge program funds apportioned to the States can best be made at the State and local levels, where officials should be the most knowledgeable about their bridges and the safety and economic considerations that are involved. These considerations vary, and selecting officials need some flexibility. The eligibility criteria should provide some flexibility but also concentrate funding on bridges in poorer condition. The States should give more emphasis to selecting bridges in the lower range of sufficiency ratings.

In selecting bridges for discretionary funding, FHWA is giving priority to bridges with legislative history with little regard to their sufficiency ratings. Several bridges without legislative history have been selected, but some of these also had high sufficiency ratings. Many bridges with sufficiency ratings of 10 or below were not selected.

FHWA needs to establish a formal project selection method for discretionary funds to ensure that bridges in the worst condition and most in need are replaced or rehabilitated first. The selection process should address factors such as sufficiency ratings, costs, and benefits.

RECOMMENDATIONS

We recommend that the Secretary of Transportation require the Administrator of FHWA to:

- Revise the project eligibility criteria for the Federal bridge program to concentrate on bridges in the worst condition and most in need of replacement or rehabilitation but still provide some flexibility for State and local governments.
- Develop a formal selection process for discretionary projects to properly weigh factors such as sufficiency ratings, costs, and benefits.

FHWA COMMENTS AND OUR EVALUATION

FHWA officials said that State and local officials must have enough flexibility to achieve a reasonable rate of obligating program funds and the latitude to interject State and local priorities into bridge replacement and rehabilitation project scheduling. The officials further said that factors other than the absolute value of the sufficiency rating must play a role in local project selection. They said that needs such as deficient bridges on schoolbus and emergency vehicle routes and that affect important local industries and commodity movement plus the need to improve all bridges on a route at the same time all play an important role in project scheduling. According to FHWA officials, the need to replace a bridge that serves a local factory employing 5,000 workers and yet has a sufficiency rating of 46 may be more critical than replacing a rural bridge with a sufficiency rating of 30 that serves only one or two subsistence farming families. The officials said that they have encouraged and will continue to encourage the States to select projects in the lower sufficiency rating categories but not to the extent that ratings become the sole criterion for project selection.

As stated earlier in this chapter, we also believe that project selection can best be made at the State and local levels where officials should be the most knowledgeable about their bridges and the safety and economic considerations that are involved. These considerations vary, and selecting officials need some flexibility. An eligibility criterion could be established to provide some flexibility and still concentrate funding on bridges in the worst condition and most in need of immediate attention. The work on bridges with higher sufficiency ratings may be needed but could be funded under other Federal-aid highway, State, and/or local programs. The bridge program, which was established to replace or rehabilitate unsafe bridges and is currently funded at slightly over \$1 billion per year, cannot be directed effectively at eliminating all deficient bridges, which FHWA currently estimates would cost \$41.1 billion.

About our recommendation concerning selecting projects for discretionary funding, FHWA officials said that they have considered and will continue to consider factors such as sufficiency ratings, costs, and benefits in making recommendations for future project selection. The officials further said that an implementation plan for the discretionary program has been established; however, the program has had much congressional direction through the legislative history process.

The legislative history of the 1978 Surface Transportation Assistance Act shows that the congressional intent was to give the Secretary of Transportation broad discretion to decide which eligible bridge projects to fund. In our opinion, it is the Secretary's responsibility to select the most worthy projects and fully document the selection process. Current selection procedures do not ensure that this is done, and a better selection method for discretionary projects is needed.

CHAPTER 5

GREATER EFFORTS ARE NEEDED TO OBTAIN COMPLIANCE WITH THE NATIONAL BRIDGE INSPECTION STANDARDS

The National Bridge Inspection Standards have been in effect for 10 years. Since their adoption, much progress has been made toward obtaining compliance with the standards. Nevertheless, some problems of noncompliance are continuing today. Furthermore, the consistency of bridge inspection ratings may be a problem, and monitoring of the bridge program needs to be improved.

For many years bridge inspection of some sort has been conducted in many States. Several States, such as Ohio and Minnesota, enacted very comprehensive legislation clearly defining inspection responsibility, inspection standards, annual inspection frequency, bridge inventory procedures, and uniform reporting of inspections before Federal legislation was enacted. According to a State of Illinois official, the State has had a bridge inventory and inspection program since 1960. Other States did not have such a program.

The Federal-Aid Highway Act of 1968 established the National Bridge Inspection Program and resulted in State and local government agencies responsible for bridge inspection either intensifying their existing programs or developing new and improved inspection programs. Today, all States have bridge inspection programs. These programs are very important in that they identify unsafe bridges and help save lives. Through inventory, inspection, and classification, a bridge can be properly identified and evaluated to reflect its true structural and safety condition. Inventory and inspection of bridges also provide a basis for bridge construction, replacement, and maintenance decisions.

The States use Federal and/or State and local funds for bridge inspections. While a total cost figure on inspections was not readily available, bridge inspections are costly. Texas, for example, used about \$5.5 million (\$4.7 million in State funds and \$800,000 in bridge program funds) to inspect its off-system bridges. Tennessee used about \$7.6 million in bridge program funds to inspect its off-system bridges. About 37 and 56 percent of the Texas and Tennessee bridges, respectively, are off-system.

BETTER COMPLIANCE WITH THE NATIONAL BRIDGE INSPECTION STANDARDS IS STILL NEEDED

Since passage of the National Bridge Inspection Standards, States have been trying hard to comply with them. However, some bridge inspectors' qualifications still do not comply with the standards; States are not meeting the 2-year inspection requirement; and a complete inventory of bridges is not being adequately

maintained. (Bridge posting and closing in accordance with the standards are discussed in ch. 6.)

Inspector qualifications and training

One of the principal provisions of the bridge inspection standards is that, at a minimum, the person in charge of a bridge inspection team should

- be a registered professional engineer or be qualified for registration as a professional engineer or
- have at least 5 years' experience in bridge inspections and have completed a comprehensive training course based on the "Bridge Inspectors' Training Manual."

To help ensure that the State and local governments' bridge inspection programs meet the standards, each FHWA Division Office conducts an annual management review of the program in its respective State. Based on these reviews, the divisions discuss any problems found within the States with State officials and in annual maintenance reports to FHWA headquarters.

A review of 49 FHWA fiscal year 1980 maintenance reports showed that 17 reports did not discuss compliance with the national standard for bridge inspector qualifications and/or training. Twenty-three reports indicated that inspectors were qualified or that the standard was being met. Nine reports mentioned problems of noncompliance. For example, the Louisiana report stated that with the exception of five State inspectors, all were qualified according to the standard and that all consultants for the off-system were qualified. The Pennsylvania report alluded to the fact that inspectors were not qualified.

Like the annual maintenance reports, our review of five States showed that inspector qualifications were basically in compliance. We found instances, however, where team leaders were not professional engineers, did not have at least 5 years' experience in bridge inspections, and had not completed a comprehensive training course based on the "Bridge Inspectors' Training Manual."

A review of personnel in seven of Pennsylvania's Department of Transportation District Offices disclosed that for six of the seven district offices, the leaders of the inspection teams were qualified. In the remaining district, none of the members of the inspection teams met the qualifications for inspectors. According to Pennsylvania officials, Pennsylvania Department of Transportation had a personnel reorganization during 1977 and 1978 in which bridge inspectors were either laid off or reassigned. The personnel who replaced the qualified bridge inspectors were inexperienced. However, the Pennsylvania Department

of Transportation has initiated new training courses to develop competent inspectors.

All of Georgia's inspectors in charge of inspection teams had at least 5 years' experience in bridge inspections; however, none of them had completed the required comprehensive training course. One of the inspectors attended a bridge inspection training school and graduated as a "certified" bridge inspector. According to Georgia State officials, each of Georgia's inspectors receives informal training to improve inspection consistency.

In Louisiana district bridge inspectors generally met or exceeded the requirements in the National Bridge Inspection Standards. However, the one exception was an inspector serving as team leader who had only 4 of the minimum 5 years' experience in bridge inspection. The initial off-system inventory and inspection in Louisiana was performed by consultants because of insufficient staff and hiring restrictions placed on the Louisiana Department of Transportation and Development. In selecting consulting firms for this initial inventory and inspection, Louisiana's consultant selection committee tried to select firms in the area where the work was to be performed and had personnel to handle the job. The Director, Preconstruction Division, told us the State set the criteria which the consulting firms had to meet, but few firms in the State were experienced in inventorying, inspecting, and rating bridges. Consultant resumes provided by the State showed that all 17 team leaders had attended a bridge inspection training course but 5 of the 17 team leaders were neither professional engineers nor had the required 5 years' experience in bridge inspection.

We have previously determined that inspectors' qualifications and training were not in compliance with the standard. In a report to the Congress entitled "Unsafe Bridges On Federal-Aid Highways Need More Attention" (RED-75-385, July 2, 1975), we noted that many bridge inspectors in the two States that were reviewed in detail were not professional engineers and had less than 5 years' experience. We recommended that FHWA instruct its regions and divisions to assess the adequacy of bridge inspector training and experience qualifications to ensure that inspections are performed by qualified personnel.

In response to our recommendation, FHWA stated that it believed inspector qualifications and training, nationwide, were only "fair" although the qualifications of team leaders in all States meet the intent of the standards. FHWA further stated that it believed that the training of inspectors was less than desirable and that it would continue to encourage and assist the States in upgrading the quality of their inspections.

Improvement needed in the inventory
and inspection of bridges

The standards require each State to prepare and maintain an inventory of all bridges on public roads. The first phase of the inventory and inspection procedure is the actual count, assigning identifying numbers, recording location, and establishing ownership of bridges in a State. The second phase, or inspection phase, is determining the condition of these bridges. Each State is then required to reinspect at least every 2 years. According to an FHWA Bridge Division official, the States' response to this requirement varies with the individual State based on such items as State law, availability of personnel and funds, and the working relationship between the States and local governments. The following examples illustrate the diversity among the States to accomplish the inventory and inspection.

- Inspection personnel in Georgia consist of five inspection teams with two State inspectors on each team. State inspectors conducted the Federal-aid bridge inspections and the initial off-system bridge inspections. According to an FHWA official, Georgia law requires off-system bridges to be reinspected by the applicable local government; however, these local government officials have emphasized that they do not have the expertise or the resources to do so. Therefore, off-system reinspections are to be conducted by State inspectors.
- In Tennessee inspection personnel consist of two inspection teams in each of four regions with eight authorized State inspectors on each team and four evaluators. These teams are responsible for inspecting all Federal-aid bridges with the exception of those in Shelby County, which conducts its own Federal-aid bridge inspections. Off-system bridges are presently being inspected by consulting firms; however, Tennessee plans to expand its State inspection teams in order to inspect both Federal-aid and off-system bridges.
- In Pennsylvania inspection personnel consist of at least two inspection teams in each of 11 districts with two State inspectors on each team and one technical administrator to a district. State-owned bridges are inspected by State inspectors while the local governments use their own inspectors or consultants to inspect their bridges. Pennsylvania State law does not allow local bridges to be inspected with State funds.

Some States lag behind on initial
bridge inventory and inspection

The Federal-Aid Highway Act of 1968 required the inventory and inspection of Federal-aid bridges and was to be completed by July 1, 1973. The inventory and inspection of off-system bridges

was required by the Surface Transportation Assistance Act of 1978 and was to be completed by December 31, 1980. Although most States have essentially completed their inventories and inspections, some States lag behind.

According to FHWA's ninth annual report to the Congress, dated July 1980, 98 percent of all Federal-aid bridges have been inventoried and inspected. An FHWA Bridge Division official stated that the Federal-aid inventory will not be 100 percent complete until the problems States are having with toll and railroad bridges are solved. These bridges are not owned by the States or local governments. The responsibility for inspection of railroad bridges is a controversial issue between the States and railroad companies. Toll bridges are not eligible for funding under the program unless specific conditions are met concerning toll collection and use. Therefore, toll commissions have a lack of motivation to report inspection results to the States for the inventory.

According to information FHWA obtains from the States, 95 percent, or 295,000, of an estimated 310,000 off-system bridges have been inventoried and inspected. Eleven States are less than 95-percent complete, as shown below.

<u>State</u>	<u>Percent of off-system bridges inventoried and inspected</u>
Mont.	93.2
Alaska	92.5
Ore.	90.5
Calif.	89.0
Fla.	88.0
S.D.	86.1
Wyo.	78.6
Okla.	75.0
Pa.	73.7
N.J.	53.2
Colo.	27.3

Some States have inventoried and inspected State-owned bridges, but the inventory and inspection of local government structures is not complete. For example, bridges on Pennsylvania State-owned highways have been inventoried and inspected; however, the bridges owned by local governments are only about 35 percent complete. In South Dakota, State highway bridges have been initially inventoried and inspected. However, as of July 1, 1980, about 40 percent of the bridges owned by local governments had yet to be inventoried and inspected. In Oklahoma, the inventory and inspection of off-system bridges is being accomplished by the Oklahoma Department of Transportation and only three cities. No counties are attempting to achieve compliance with the standards.

States are having problems
reinspecting their bridges

The standards require each bridge to be inspected at regular intervals not to exceed 2 years. Factors such as age, traffic characteristics, maintenance condition, and known deficiencies determine the extent and frequency of inspections.

Some States are not reinspecting their bridges as required. As a result, some unsafe conditions and maintenance needs may not be identified. Furthermore, State inventories and, therefore the national bridge inventory, do not accurately reflect State inspection data.

A discussion of inspection frequency for the five States in our review follows.

--In Georgia more than 99 percent of the bridges on the State and Federal-aid system have been reinspected within the 2-year interval. Off-system county bridges, however, have not been reinspected within the 2-year requirement. Georgia initially completed its inventory and inspection of off-system county bridges as early as September 1978 and advised its counties that off-system county bridges would not be reinspected by the State because of inadequate resources. The Georgia Transportation Commissioner disagrees that reinspecting all bridges on a 2-year basis has significant value and he said that Georgia needs to spend more money repairing and replacing deficient bridges. He contends that Georgia will spend more time inspecting individual needy bridges than inspecting bridges which are in relatively good condition.

Georgia State officials pointed out that their off-system inspections are now overdue primarily because they completed the initial off-system inspections much in advance of the December 31, 1980, deadline. These officials further stated that there was little incentive to reinspect off-system bridges because FHWA does not use off-system data to apportion funds among the States.

The counties were to provide updated bridge information to the State. The counties, however, did not provide this information and were not reinspecting their bridges. Because of recent publicity on the condition of the off-system county bridges and concern that many unsafe bridges may not be closed to traffic as recommended after the initial inspections, the State has revised its decision and will reinspect county off-system bridges with State funding and personnel. The Georgia Department of Transportation began reinspecting its off-system bridges in February 1981.

--Tennessee State officials believe they are close to meeting the 2-year inspection requirement and do not consider

inspection reports that are only a few months late a major problem. Officials stated, however, that inspections have probably been late more than they have been on time since the inception of the program because "special" requirements or problems always seem to arise that prevent inspections from being completed exactly on schedule.

The following table shows the status of the inspection teams in each region on July 1, 1980. Each inspection cycle begins in July.

Table of Lateness of
Regional Inspection Teams

<u>Region</u>	<u>Team</u>	<u>Status as of July 1980</u>
I	A	2 months ahead of schedule
	B	2 months ahead of schedule
II	A	1 month behind schedule
	B	1 year behind schedule
III	A	1 month behind schedule
	B	8 months behind schedule
IV	A	On time
	B	On time

As shown in the above table, inspection teams in region I were 2 months ahead of schedule. On the other hand, a team in region II was 1 year behind schedule.

--According to the national bridge inventory data as of October 31, 1980, the Pennsylvania Department of Transportation meets the requirement to inspect bridges at least every 2 years about 80 percent of the time. Pennsylvania officials, however, believed that the percentage of adherence was even higher because the Pennsylvania Turnpike Commission inspects its bridges more frequently than every 2 years but does not regularly report the data to the State. These officials said that because the Pennsylvania Turnpike is a toll road and not eligible for funding, the Turnpike Commission is not motivated to report its inspection results to the State. Although Pennsylvania intends to keep its inspection cycle within a 2-year period, not all districts are meeting the requirement. For example, in district 10, a flood in 1977 set the cycle back by approximately 6 months. In district 12, inspections are conducted every 3 years because of paperwork backlog and time-consuming inspections required for several major structures over rivers in the district.

--A review of inspection dates for the 10,068 Federal-aid bridges in Illinois' inventory as of December 31, 1980,

showed that 1,334 bridges had delinquent inspection dates. Based on information obtained from an Illinois official, we concluded that 774 of these bridges had been inspected but the data had not been updated in the inventory. Of the remaining 560 bridges--362 were city, private, or toll-owned for which the Illinois Department of Transportation and Development did not receive revised inspection data--132 were new or newly discovered bridges, record errors, bridges that were closed, removed, or under construction. Inspection dates on the remaining 66 bridges were not resolved during the course of our review. According to an FHWA official in Illinois, inspections are being performed at approximately 2-year intervals. He said that when determining whether Illinois is in compliance with the standard, the number of people and levels of review involved in inspections must be considered.

--Louisiana's quarterly report on inspections due showed that at least 337 bridges had not been inspected as scheduled as of August 27, 1980. The ratings for 17 of these bridges indicated that the bridges were not performing the function for which they were intended. Three of these structures (two on a 6-month inspection schedule) had not been inspected since 1978. Two structures (on a 2-year inspection schedule) had not been inspected since 1975. Inspection due dates for seven bridges were fairly current, and a Louisiana State official told us that it may take up to 6 months to add revised data to the State inventory.

A review of FHWA's fiscal year 1980 annual maintenance reports showed that some States were not in compliance with the 2-year inspection requirement. New Jersey, because of time and personnel constraints, inspects its State-maintained bridges on a 3- to 4-year cycle. As of April 30, 1980, 36 percent of Oregon's county- and city-owned bridges were not on a 2-year cycle. Eleven percent had lapsed over a 4-year cycle. Local counties in Indiana reinspect their bridges at least every 2 years but bridge reports are only prepared every 4 years because of limited funds. New York has instituted a program for inspecting local system bridges on a 3-year cycle.

Because of the inaccuracy of the inspection data in some State inventories and in the national bridge inventory, some States as well as FHWA cannot use the data to determine compliance with the 2-year inspection requirement. According to the national bridge inventory data, as of October 31, 1980, 24 percent of the Federal-aid bridges had not been reinspected within 2 years as required. About 15 percent of the inspection dates for these bridges were 3 or more years old.

Number of Federal-aid Bridges Not Reinspected
Within 2 Years as Shown in the
National Bridge Inventory

	<u>Number of bridges</u>	<u>Percent of total Federal-aid bridges</u>
3 months late	15,442	6.1
6 months late	7,360	2.9
1 year late	9,100	3.6
2 years late	12,237	4.8
Over 2 years late	<u>16,990</u>	<u>6.7</u>
Total	<u>61,129</u>	<u>24.1</u>

National bridge inventory data showed that in seven States, 20 percent or more of the inspection dates for Federal-aid bridges were 4 or more years old. Tennessee, for example, had about 5,900 bridges, or 81 percent of its total bridges, with inspection dates over 2 years old. Over 60 percent of these dates were over 4 years old.

Through discussion with FHWA and State officials in Tennessee and review of State records, we determined that the processing of inspection reports could be causing incorrect or outdated inspection dates to be reported. First, bridges are being inspected but inspection reports are initially only processed for bridges that have an overall condition rating of critical or which have a scour condition that is marked poor or critical. Inspection reports for other bridges are processed as time permits. Because of a backlog of paperwork, Tennessee's inventory and the national bridge inventory may never be updated to show that inspections were made on these bridges.

FHWA division officials were aware that some reports were not processed but were not aware of the number of inspection dates that were over 2 years old. They said that the inspection intervals for bridges they visited or performed a desk review of generally had been fairly close to meeting the 2-year interval.

Also, State officials said that for a long time a keypuncher updated the other information on the file without changing the date of the inspection. Therefore, the inspection data stored on Tennessee's system may be correct but it would appear to be out of date until further inspection reports are processed and inspection dates changed. Tennessee Department of Transportation and FHWA officials did not know to what extent this had occurred and, therefore, do not know if inspection data for bridges in the inventory is current or outdated.

Other States also have lengthy processing of inspection reports or do not receive inspection data as frequently as needed. The Louisiana Department of Transportation and Development told us it enters each reinspection in the computer system but the

process of inputting a new report may take up to 6 months. About 58 percent of Illinois bridges with delinquent inspection dates as of December 31, 1980, may have been inspected, but the data may not yet have been updated in the inventory. Including data in Illinois' State inventory takes from 6 to 15 months because of the levels of review that the data flows through and keypunching. The Pennsylvania Turnpike Commission inspects its bridges once a year but does not regularly report the data to the Pennsylvania Department of Transportation. Also, updating Pennsylvania's inventory takes 19 to 50 days from the date of inspection. After inspection in Pennsylvania, up to 5 weeks may elapse before the inspection data is transferred to FHWA's Bridge Structure Inventory and Appraisal form, and keypunching takes from 4 days to 2-1/2 weeks.

Local governments are concerned over
inventory and inspection responsibility

Although some States, such as Tennessee and Texas, have assumed responsibility for inventory and inspection of off-system bridges, local governments in other States with the responsibility of inventorying and inspecting their bridges have expressed concerns about this process. Some State laws preclude the States from inventorying and inspecting local government structures. An FHWA Bridge Division official agreed that some local governments do not have sufficient funds or personnel to perform the functions needed to fully comply with the 2-year inspection requirement.

Georgia law leaves the responsibility for off-system bridges to the applicable local government. Local government officials in Georgia emphasized that they have neither the expertise on hand nor the resources to conduct or contract for bridge inspections if the reinspection requirement was left to them. (Ga. State inspectors conducted initial off-system inspections.)

Except for a few cities, counties, and toll commissions, local government agencies in Pennsylvania do not have an ongoing systematic bridge inspection program. Pennsylvania State law precludes the State from inventorying and inspecting local government bridges. The State, however, has established a process and procedure to aid the local governments with the inspection and inventory process and has been successful in obtaining the cooperation of most of the State's 67 counties to administer and inspect all of the bridges within each county. This includes inspecting the bridges for both the county-owned structures and those owned by cooperating local governments within the county that have bridge maintenance responsibilities.

Pennsylvania officials said, however, that some local governments are slow in participating in the program because of funding and some do not participate in the program. For example, Chester County has an established bridge inspection program that has the information needed to complete the Pennsylvania inventory coding sheets. Chester County did not receive Federal funds

because the Pennsylvania Department of Transportation required the compilation of a report on each bridge, including photos and calculations, and Chester County did not feel it was cost effective to meet these requirements. In Northumberland County and Huntingdon County, local agencies were reluctant to participate in the program because of funding, lack of interest and knowledge, and a reluctance to become involved in government "red tape."

Although State inspectors and consultants conducted off-system inspections in Texas, local officials are concerned over the liability created by the inspections and obtaining the 20-percent matching requirement once their bridges are selected for funding. One county in the State refused to have its bridges inspected because it feels that the bridge inspection program is unnecessary and Texas does not have a State law that would allow the State to inspect local government structures.

In a report ^{1/} to FHWA, the National Association of Counties Research, Inc., stated:

"County officials have mixed feelings about FHWA's requirement for reinspection of all public bridges on a two-year cycle. Although they believe reinspection is necessary, county officials claim that FHWA's requirement creates a financial and administrative hardship for counties without professional engineers that must rely upon the services of consultants."

The Association recommended that:

"Each state highway agency shall establish a bridge inspection program to collect and maintain data, compatible with FHWA data collection efforts, on all bridges statewide and to provide training and technical assistance to local governments so that federal bridge reinspection requirements can be met."

During American Public Works Association seminars, local officials were concerned about the local liabilities if inspections showed a structure was dangerously deficient and accidents resulted that were alleged to be caused by these deficiencies. One county official stated that his county felt that obtaining Federal assistance was not worth the effort. Another stated that his county could build bridges equal to those built to State and FHWA specifications at substantially lower cost than those using Federal assistance.

^{1/}"Communications With County Governments," final report, June 1980.

Incomplete, inaccurate, and unreliable
data detected

The standards require structure inventory and appraisal data for each bridge to be recorded and retained by the State for collection by FHWA as needed. Based on our review at FHWA and the State offices, the inventory in general appears to provide a reasonable indication of overall bridge conditions. However, we identified several instances of incomplete, inaccurate, and unreliable data.

First, as previously stated, the inventory of bridges on the Federal-aid system is not complete and, according to an FHWA Bridge Division official, will not be 100 percent complete until the problems States are having with toll and railroad bridges are solved. The off-system bridge inventory was not entirely complete as of the December 1980 deadline. Some States encountered problems with local government structures.

Also, 827, or 10 percent, of Tennessee's Federal-aid bridges were inadvertently deleted from the inventory. A Tennessee State official said that several other groups within the Tennessee Department of Transportation have access to the department's bridge data and that he believed that most of the bridges had been on the data system. The official said that he randomly checked 33 bridges and found that 30 bridges appeared on an earlier print-out. He said that his office often comes across entire routes that have been deleted, usually because other groups have improperly used the data system.

Second, in many cases, data in the inventory such as the estimated cost to rehabilitate or replace a structure and/or bridge ownership was not provided. According to an FHWA Bridge Division official, many States have not included cost data in their State inventories.

Third, the standards require newly completed structures or modifications to existing structures to be entered in the records within 90 days. In both Louisiana and Illinois, we found instances where newly completed structures were not included in the inventory within 90 days.

A review of 18 newly completed bridges in Illinois showed that only one bridge met the 90-day requirement. An Illinois Department of Transportation official said, and an FHWA official agreed, that generally inventory and inspection data for newly constructed or reconstructed bridges is not placed in the inventory within 90 days. The State official said the inventory and inspection data is consolidated by each level of review and that the process takes 4 to 6 months to get data on newly completed bridges into the inventory after receiving it from local agencies. According to the FHWA official, the Illinois Department of Transportation does not submit inventory data for a new bridge until the State accepts maintenance responsibility. The final

acceptance may be delayed for months while the contractor makes changes or repairs requested by the Illinois Department of Transportation.

Our review of 63 bridges in Louisiana showed that two bridges constructed in 1978 were not in Louisiana's inventory. There was no apparent reason why one project was not in the inventory. The assistant bridge maintenance engineer told us the bridge folder was missing and data for the former structure had been deleted from the inventory, indicating an attempt was made to update the files. According to the maintenance engineer, the other project was not in the inventory because the computer staff never received a structure update form on the new bridge and the controls used to detect such errors failed.

Fourth, data was not revised in a timely manner to reflect current data on inspection reports. In many cases, Tennessee, Louisiana, and Illinois had more current inspection reports; however, the inventory had not been revised to reflect this information. In Tennessee, inspection reports for the "worst bridges" are evaluated and included in the inventory, whereas inspection reports for other bridges are evaluated and included as time permits. In Louisiana, data on inspection reports may lag behind for 6 months before the information is entered into the inventory. In Illinois, depending on the amount of batching that takes place at the local and State levels, revising data in the inventory takes from 6 to 15 months. In addition, as previously stated, in Tennessee a keypuncher had updated information in the inventory without changing inspection dates. An Illinois State official told us that there is no requirement to process inspection data within a certain period of time.

Because FHWA headquarters' inventory is a compilation of State data, its inventory is not always complete and accurate. For example, the national bridge inventory showed that about 588 bridges on the Federal-aid system were closed as of December 31, 1980. Because an FHWA Bridge Division official was concerned about the accuracy of this figure, he requested closed bridge data from the FHWA field offices. According to data obtained from the official, the number of closed bridges as reported by the field offices showed that only 325 were closed.

In addition, sufficiency ratings are calculated by FHWA headquarters based on data obtained from the States. If States do not send in adequate data to compute the sufficiency rating, substitute values that would not lower the rating are used to compute the rating. As of October 31, 1980, over 18,000 deficient bridges in the national bridge inventory had substitute values for at least one item.

According to an FHWA Bridge Division official, FHWA is aware of problems within the States' inventories. A review of documentation at FHWA headquarters showed that the FHWA Bridge Division emphasizes to the FHWA Regional and Division Offices and the

States the need for complete and accurate data and informs States of errors in its inventory. The official stated that the office will expand its efforts to correct inventory data problems in the future.

Tennessee's response to noted deficiencies

During discussions with State of Tennessee officials concerning deficiencies identified during our review, the officials stated that:

--Some of the teams are behind in their 2-year inspection cycle. The inspection teams are being reviewed and the necessary personnel will be added to bring the teams up to strength, which will allow two smaller field units to operate out of an original single team (eight people). Also, one new team will be added to each region to accommodate the off-system bridges.

--The bridges that were deleted from the inventory have been determined. The records are being put back on the file and procedures that will allow record changes but prevent erroneous deletions from the files will be established.

--The Structure Inventory and Appraisal Section was organized and staffed to comply with Federal law for the Federal-aid system bridges. The advent of the off-system program and the additional 9,000 bridge reports coming into the office have required some changes in procedures. After the reports are received, they are reviewed and those whose overall condition rating is poor and critical are pulled out for in-depth evaluation. The reports rated fair or good do not generally change significantly and certainly would not have structural problems. There may be some minor coding changes which can be done in the field and reviewed in the State office. This allows State officials to maintain a 2-year evaluation cycle and to review the reports in a timely manner after they are received. Attempts are being made to add some nonprofessional personnel to make the report and paper processing activities more efficient. Increased efforts will be made to better utilize the computer and eliminate as much manual labor as possible.

INCONSISTENCY IN BRIDGE INSPECTION RATINGS IS A MAJOR CONCERN

Consistency is a major concern of FHWA, State, and local officials. Although we did not conduct technical evaluations of the consistency of bridge inspections, we noted the following during our review:

--Inspections officials rated bridge components differently because of the amount of judgment involved.

- Some States did not use FHWA's bridge description ratings but have developed their own.
- The number of officials used to inspect and rate about the same number of bridges and the cost of inspections varied considerably by State.
- A wide variance existed in the percentage of deficient bridges between States where it appears conditions should be similar.

According to FHWA and State officials, bridge inspections and ratings involve a considerable amount of judgment by bridge inspection officials. For example, several States and FHWA disagree on the rating that a bridge should receive because of scour 1/ potential. In Tennessee, a State which has one of the more severe scouring problems, officials told us that all bridges have scour potential and that they did not believe a bridge should receive a lower rating because of scour potential. Tennessee officials said they rate a bridge down for scouring only if scouring has occurred; it has not been corrected; and the potential for further, more serious problems is present. Officials said that when scouring is detected, actions are taken as soon as possible to correct it. On the other hand, a State of Louisiana bridge rating official and FHWA headquarters officials told us that a bridge can and should be rated lower because of scour potential if a very real potential for it exists. In cases where a real danger exists, scour can be reflected in the water-way adequacy rating or, more importantly, in the substructure rating.

Inspection ratings given bridges by inspection officials can vary within a State and from State to State. FHWA's fiscal year 1980 annual maintenance report in New Mexico stated:

"There continues to be somewhat of a problem in the interpretation and uniform application of the bridge rating criteria. The ratings are, to a certain extent, a subjective type evaluation. It is difficult to get five individual crews on the same wave length. This is magnified when adjustments are made to fit other states or the relatively loose criteria in the National coding guide. It is also more evident on the off-system structures where conditions vary to extremes and additional inspection crews were involved."

1/The removal and carrying away of soil, sand, etc., from the bed or banks of rivers or streams because of the erosive action of running water. Scouring around bridge foundations, for example, can cause collapse if enough material is eroded from the foundation supports.

Tennessee officials told us that two highly trained and skilled engineers might disagree on a rating for a particular item on the same bridge. In Tennessee we observed several instances in which significant changes were made in the inspection data by an evaluator's supervisor because of the amount of judgment involved and thus in the sufficiency ratings that would be based on this inspection report. In one case, a bridge that was rated by an evaluator received a sufficiency rating of 48. Subsequent reevaluation of the same inspection report by his supervisor resulted in the bridge receiving a sufficiency rating of 18.8, a difference of 29.2.

We performed a limited test of the consistency of ratings given bridges by State inspection officials in different States and officials in the same State. Ten randomly selected bridges in Tennessee that had been rated by Tennessee officials were rated by officials in the four other States in our review. All inspectors used Tennessee's bridge inspection reports to rate the bridges. Because of time constraints, Louisiana officials were not able to complete their evaluation of the bridges and were therefore not included in our results. In some instances, State officials indicated that they would have liked more information for certain items and that judgment was used in assigning a rating.

While inspection officials from the four States agreed on some of the ratings, particularly the very poor bridges, a rather wide variance in the ratings existed for several of the bridges. Eight of the 10 bridges had a variance of 10.4 or more. The sufficiency rating of one bridge had a variance of 39.5; another had a variance of 43.0; and still another, of 51.4. One of these bridges was given a sufficiency rating of 19.5, 19.6, 44.0, 49.1, and 59.0. Two of the officials that rated this bridge were from the same State. One of the two officials gave the bridge a sufficiency rating of 44 and the other official gave the bridge a rating of 59, a difference of 15.

Similarly, in half the cases inspection officials disagreed about whether a bridge was structurally deficient, functionally obsolete, or not deficient. Based on the ratings assigned components of the bridge by the State inspection officials and FHWA's definition of a deficient bridge, we determined that the officials had a consensus that 4 of the 10 bridges were structurally deficient and 1 bridge was not deficient. As shown in appendix IV, the remaining five bridges based on the different ratings assigned by the inspection officials could either be classified as structurally deficient, functionally obsolete, or not deficient.

Not all States use the bridge description ratings in FHWA's recording and coding guide to rate bridge components. FHWA regional office and Illinois Department of Transportation officials told us that the wording used to describe the numerical ratings for bridge components in FHWA's coding guide is poorly defined

and should be improved. For example, the table on the following page shows the various appraisal descriptions used to evaluate waterway adequacy. Waterway adequacy is one of the factors that can make a bridge deficient.

FHWA's appraisal descriptions shown in the table are to be used to rate six different bridge components--structural condition, deck geometry, underclearances, safe load capacity, waterway adequacy, and approach roadway alignment--whereas Georgia and Illinois appraisal descriptions are more specific and are to be used to rate waterway adequacy only. These States have a different set of descriptions for each of the six bridge components.

In addition, we found a wide variance in the number of inspection officials that inspect bridges and in the cost of inspections. For example, Georgia has 10 inspection personnel that inspect and evaluate their 7,700 Federal-aid bridges, while Tennessee has 57 inspectors and 4 evaluators for their 7,303 Federal-aid bridges. State inspection personnel in Georgia also conducted the initial 7,044 off-system bridge inspections with State funds. Tennessee used bridge program funds and hired 12 consulting firms to inspect its 9,296 off-system bridges in order to ensure that the inspections were completed by the December 31, 1980, deadline. Georgia completed its initial off-system inventory and inspections about September 1978, and officials told us their Federal-aid inspections were behind but are now current. Tennessee did not complete its off-system inspections until late November 1980 and one of Tennessee's Federal-aid inspection teams was 1 year behind schedule.

We observed differences in the costs paid for off-system inspections. Tennessee paid consultants an average of \$814 per bridge to inspect 9,296 off-system bridges. Mississippi was able to get county engineers (some of the county engineers were consultants) to inspect 9,433 off-system bridges for only \$43 per bridge. Consultants inspected about 57 percent of Texas' 17,100 off-system bridges and the remainder was inspected by State personnel. The average cost of inspections was \$323 per bridge. The average cost of inspections in Illinois was \$150 per bridge for 16,500 off-system bridges.

Also, large differences existed in the percentage of deficient bridges between States where it would appear conditions should be similar. For example, as of December 31, 1980, 40 percent of New York's Federal-aid bridges were deficient, and only 16 percent of Pennsylvania's Federal-aid bridges were deficient. Pennsylvania highway officials believed the condition of the bridges in New York and Pennsylvania to be similar and that Pennsylvania has not received an equitable share of the funds in relation to need when New York is compared to Pennsylvania. A New York highway official stated that New York has many bridges in deficient condition but could not make a comparison of the bridge conditions in the two States.

Comparison of Appraisal Descriptions Used to Evaluate Waterway Adequacy

<u>Numerical rating</u>	<u>FHWA's January 1979 coding guide</u>	<u>Georgia descriptions</u>	<u>Illinois descriptions</u>
N	Not applicable.	Not applicable.	Leave blank--not applicable.
9	Conditions superior to present desirable criteria.	Exception.	Waterway opening exceeds required capacity.
8	Conditions equal to present desirable criteria.	Good condition; no problem.	Waterway capacity equals current standards (no problems).
7	Condition better than present minimum criteria.	Minor to good condition.	Waterway opening exceeds minimum conditions (minor problems).
6	Condition equal to present minimum criteria.	Minor erosion or scour.	Waterway opening is minimally adequate but some problems are present.
5	Condition somewhat better than minimum adequacy to tolerate being left in place as is.	Major to minor.	Condition of waterway is below standards with problems present. No immediate hazard to the structure is evident.
4	Condition meeting minimum tolerable limits to be left in place as is.	Major erosion or scour. Water elevation approaches superstructure at high water.	Stream bed showing scour, erosion or other symptoms of insufficient capacity when subject to heavy runoff.
3	Basically intolerable condition requiring high priority of repair.	Critical erosion or scour; repairable.	Condition of waterway indicates the possibility of failure or damage to the bridge because of insufficient waterway opening (functionally obsolete).
2	Basically intolerable condition requiring high priority of replacement.	Critical erosion scour; not repairable, or high water is on superstructure.	Critical condition--bridge could fail or settle under flooding conditions. (Replacement warranted.)
1	Immediate repair necessary to put back in service.	Bridge closed; repairable.	Bridge closed to traffic requiring repairs for temporary return to limited service. High replacement priority.
0	Immediate replacement necessary to put back in service.	Bridge closed; replacement.	Bridge closed to all traffic and beyond repair.

Likewise, 13 percent of South Carolina's Federal-aid bridges were deficient compared to 53 percent of North Carolina's. An FHWA regional official in Georgia did not believe the difference between the percent of deficient bridges reported by neighboring States resulted from inconsistencies in rating procedures. He said that possibly (1) North Carolina may have already reinspected most of its bridges using the revised AASHTO coding definitions whereas South Carolina may still have the bulk of its bridges inventoried under the old definitions or (2) since FHWA allows the States to measure the adequacy of its bridges against its current design standards, some States may adopt AASHTO desirable standards for its evaluations where others may adopt AASHTO's revised minimum standards as their standards.

MONITORING OF THE BRIDGE INSPECTION
PROGRAM SHOULD BE IMPROVED

Both FHWA and the State highway departments monitor the administration of the bridge program in each State. This monitoring needs to be improved.

FHWA regulations require each FHWA division to conduct a management review of the bridge program in its respective State. In selected State highway district(s), the FHWA divisions review inspection procedures, frequency of inspection, qualifications of the personnel, inspection reporting, and the status of the bridge inventory and observe inspection teams as actual inspections are made on selected bridges. The number of bridges observed varies in each State. For example, in fiscal year 1980 the FHWA Division Office in New Mexico field checked about 20 off-system bridges whereas the FHWA Division Office in Kansas accompanied a State official on four inspections.

State highway officials usually accompany FHWA inspection personnel on their visits. During these visits, FHWA division and State officials attempt to improve inspection consistency among the inspectors by discussing problems and concerns identified during inspections with the teams. State highway officials make other visits within a State when situations or problems arise that make them necessary.

The FHWA Division Offices are to report annually to FHWA headquarters on the bridge program in each State. According to FHWA requirements, the report should contain a discussion of a State's compliance with the National Bridge Inspection Standards covering such things as qualifications of personnel, inspection frequency, inventory, inspection procedures, and inspection reports. Our review of the annual maintenance reports for fiscal year 1980 showed that although problems of noncompliance are stated, many FHWA divisions do not adequately discuss compliance with the standards as required. Some of the standards are not mentioned at all. In fact, the FHWA divisions in Montana and South Carolina did not submit reviews of their States' bridge inspection program because of staffing problems.

The Bridge Division in FHWA headquarters had a record of reviewing about 37 percent of the fiscal year 1979 reports and at the time of our review had not reviewed the fiscal year 1980 reports. According to an FHWA Bridge Division official, the reports are reviewed as time permits.

FHWA Bridge Division officials told us that they need to review the inspection program of 10 to 15 States every year. During an FHWA headquarters review, an FHWA Bridge Division official visits a State and, accompanied by regional, division, and State officials, reviews records and training and observes inspection teams. The FHWA Bridge Division reviewer, accompanied by FHWA division and State inspectors, will take some completed reports out to the applicable bridges and check the accuracy of the data.

During the early years of the program, FHWA headquarters conducted from 10 to 14 reviews of the National Bridge Inspection Program each fiscal year. However, as shown in the following table, the number of reviews conducted during the later years of the program decreased considerably.

<u>Fiscal year</u>	<u>Number of FHWA headquarters' reviews</u>
1972	14
1973	12
1974	10
1975	13
1976	10
1977	5
1978	6
1979	2
1980	2

In fiscal years 1979 and 1980, only two reviews were conducted each fiscal year. According to an FHWA Bridge Division official, travel funds and staff reductions limited the number of headquarters reviews during these fiscal years. FHWA headquarters has tentatively scheduled six reviews for fiscal year 1981 because of lack of travel funds.

According to FHWA Bridge Division officials, when they find that a State is behind in meeting specific requirements of the standards, they encourage the State to assign sufficient resources to proceed at a faster pace. FHWA has the authority to withhold Federal-aid funds or to take other action deemed appropriate by the FHWA Administrator if a State fails to comply with the standards. FHWA has never asked the Secretary to withhold Federal-aid funds from a State. However, FHWA Division officials in Illinois told us that FHWA recently withheld bridge program funds from two Illinois counties for not providing current inventory data to the State.

CONCLUSIONS

Much progress has been made toward developing laws and regulations pertaining to bridge safety. Each State is required to maintain a bridge inspection program that will insure the safety of bridges and the public.

Because of the National Bridge Inspection Standards, which were developed to provide minimum criteria for bridge inspections, all States now have bridge inspection programs and both Federal-aid and off-system bridges are being inspected. These programs identify unsafe bridges and maintenance needs and provide data used in bridge construction, replacement, and maintenance decisions. Although States are in substantial compliance with the standards, there are still problems of noncompliance.

The national bridge inventory is not complete. Inspection data on toll and railroad bridges have hampered completion of the Federal-aid bridge inventory and inspection. Eleven States have completed less than 95 percent of their initial off-system inventory and inspections. The inventory and inspection of local government structures in several of these States have not been completed.

Some bridges are not being reinspected within 2 years. Lack of adequate funds, personnel, and time have all contributed to this requirement not being met. Most inspectors are qualified, but some still do not meet the qualifications specified in the standards.

Local governments have expressed concern about the responsibility of inventorying and inspecting their bridges. Some local governments do not have adequate funding and personnel to inspect their bridges. Others are concerned over their liability created by the inspection.

FHWA and the States have not given enough attention to maintaining an accurate, current, and reliable bridge inventory. A backlog of paperwork and lengthy processing of inspection reports cause inventories to be outdated. Based upon inventory problems noted during our review, we believe the completeness, accuracy, and reliability of some State inventories and the national bridge inventory need to be improved.

Inconsistencies appear to exist in bridge inspection ratings. The inconsistencies we identified demonstrate the need for improved communication and training and more consistent practices within a State and among States and better monitoring by FHWA.

RECOMMENDATIONS

We recommend that the Secretary of Transportation direct the Administrator of FHWA to:

--Assess the States' and local governments' compliance with the National Bridge Inspection Standards and develop a strategy for bringing about full compliance. As part of the assessment, the Administrator should determine (1) whether any of the requirements should be strengthened or lessened, such as the 2-year reinspection requirement, (2) whether FHWA should encourage State governments to assume authority for off-system inspections, and (3) the need to penalize or take other action against those governments that do not comply. The results of the assessment should be included in the annual report to the Congress on the bridge program.

--Increase efforts to ensure that the national bridge inventory is complete, accurate, and current and that inspection procedures and bridge ratings are consistent. At a minimum, these efforts should include (1) more FHWA monitoring, including a greater number of FHWA Bridge Division and regional office management reviews, (2) development of a standard for the timely processing of inspection data, and (3) more descriptive and better defined bridge condition rating codes to be used in all the States.

FHWA COMMENTS AND OUR EVALUATION

FHWA officials said that the progress and national level of accomplishment to date have been extraordinary and that the achievement of the States and local governments in inspecting and evaluating their bridges is remarkable considering the short time frame provided by the 1978 Surface Transportation Assistance Act.

We agree that State and local governments, as a whole, have made substantial progress and are trying hard to comply with the National Bridge Inspection Standards. However, the standards were established as minimum requirements for the proper safety inspection of bridges. Many State and local governments are not fully meeting these requirements. Some local governments have simply refused to inventory and inspect their bridges in accordance with the standards. Substantial compliance with some of the standards may not be enough. For example, 95 percent of the estimated 310,000 off-system bridges have been inventoried and inspected--a major accomplishment. However, about 15,500 off-system bridges have not been inventoried and inspected and may be unsafe to those who use them. Other requirements, such as reinspecting all bridges at least every 2 years, may need to be reexamined. Some State and local government officials have complained that not all bridges need to be reinspected every 2 years. We believe that these considerations should be a part of FHWA's assessment of State and local government compliance with the standards and its development of a strategy to bring about full compliance with the standards that prove essential to bridge inspection.

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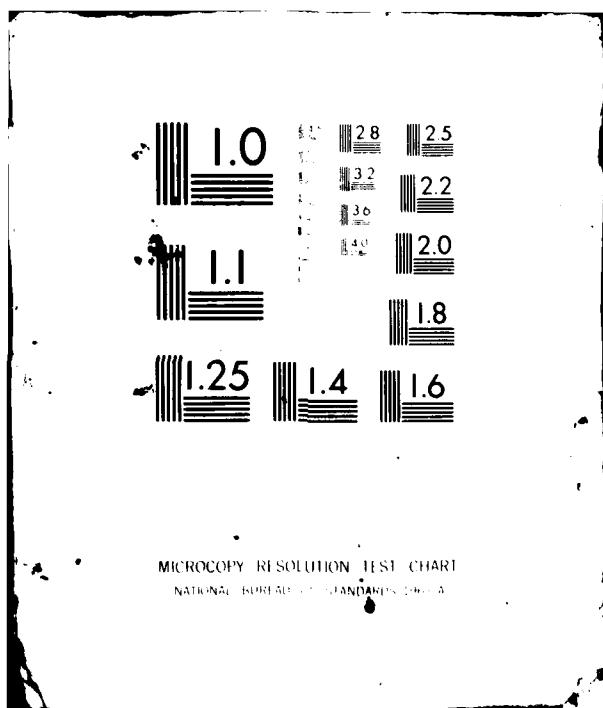
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FHWA officials further commented that they will continue to promote improvement in compliance with the 2-year reinspection requirement and that they are evaluating possible changes in the National Bridge Inspection Standards to simplify procedures and improve the cost-effectiveness of inspection.

FHWA officials stated that they do not completely agree with FHWA's encouraging State governments to assume authority for off-system inspections. According to the officials, current law and regulations specify the National Bridge Inspection Standards as a State responsibility but do not specify which, if any, Government entity must carry out the inspections. The officials said they look to each State highway agency as the responsible party to assemble and submit data for the national bridge inventory. They stated that they do not believe it proper to require that States assume authority for off-system inspections. However, FHWA intends to continue encouraging State highway agencies to take the lead in National Bridge Inspection Standards' compliance but not to the extent that local prerogatives are usurped. The FHWA officials concluded that the authority for off-system inspections is a local matter that is best determined at local and State levels.

We also believe that the authority for off-system inspections should be decided at State and local levels, and we are not recommending that FHWA require the State governments to assume this authority. However, encouraging State governments to assume authority for off-system inspections is a possible strategy for bringing about better compliance with the standards, and we recommend that FHWA consider its merits. In those cases where local governments refuse or do not have adequate resources to comply with the standards, it may be necessary for State governments to perform off-system inspections.

FHWA officials stated that FHWA has considered the need to penalize or take other specific action against governments that do not comply with the inspection standards. The officials said that the Department of Transportation has proposed highway legislation that would provide for imposing unsatisfactory maintenance sanctions against portions of, or local governmental units within, a State rather than the State as a whole.

Penalties against State or local governments are also a tool that FHWA should consider to bring about compliance with the inspection standards. Specific penalties for failure to comply with the standards may be needed.

FHWA officials said that FHWA will attempt to comply with our recommendation for more monitoring; however, the current constraints on travel and personnel will make it difficult to increase management review much in this program.

We believe that more FHWA monitoring of the program is needed and that management reviews are an important element of FHWA monitoring. However, we also recognize that the needs of this program must be weighed against the needs in other areas and that it may not be possible to increase substantially the number of management reviews. However, FHWA can improve its monitoring by more effectively using FHWA Division Office personnel, the annual maintenance reviews, and the national bridge inventory.

FHWA officials said they believe that processing of data submitted by the States to the national bridge inventory is very efficient and expedient. They said that some States could improve and expedite their data processing procedures, and FHWA will work with them individually to provide assistance and guidelines to improve their processes.

All five of the States we reviewed had data processing problems to some extent. For example, including new or revised data in the Illinois inventory took from 6 to 15 months. Each State is required by 23 U.S.C. 116, as amended, to maintain a current inventory of all bridges. We believe that FHWA needs to develop a standard for the prompt processing of inventory data to ensure that State inventories are current. The standard should reflect FHWA's and the States' needs for current data.

FHWA officials said that they are evaluating and improving the rating code descriptions as we recommend. According to the officials, they intend to proceed very cautiously to be sure that any changes in the coding guide are truly improvements and are cost-effective from both a local and national viewpoint.

We think that, in addition to improving the code descriptions, all States should use the descriptions without major modifications. Bridge program funds are distributed to the States based on how State and local governments rate their bridges. Bridge ratings are also used in decisions on replacement, rehabilitation, and maintenance. Rating consistency is important, and it is essential that the same coding descriptions are used and consistently applied.

CHAPTER 6

BRIDGE POSTING AND CLOSING: MORE NEEDS

TO BE DONE TO PROTECT THE MOTORING PUBLIC

Although structurally deficient bridges may interrupt orderly and efficient traffic flow and limit the highways' use, they can be safe if they are properly posted to restrict their traffic to lighter vehicles. Bridges that cannot support any traffic must be closed. Of course, these bridges are safe only if the motorizing public abides by the posting or closing notices. If structurally unsafe bridges are not properly posted or closed or the public does not heed posting or closing notices, bridges can collapse, endangering lives and risking property damage.

Our review of FHWA and State inventory and other data, such as FHWA annual maintenance reports and discussions with FHWA, State, and local officials, revealed several problems with bridge postings and closings. These were:

- Structurally deficient bridges are not always properly posted or closed.
- Bridge postings and closings are often ignored by the motorizing public.
- Postings and closings are not being properly monitored and enforced.

Data was not available to determine how pervasive these problems are, but we believe that public safety is a concern and that these problems warrant greater attention by FHWA and State and local governments.

BRIDGE POSTING AND CLOSING REQUIREMENTS AND RESPONSIBILITIES

The National Bridge Inspection Standards require bridges to be rated as to their safe load-carrying capacity in accordance with the AASHTO Manual for Maintenance Inspection of Bridges and action to be taken to protect the traveling public against structurally weak or inadequate bridges. The AASHTO manual requires bridges to be rated at two load levels: the operating and inventory ratings. The operating rating is the upper load level and represents the absolute maximum load to which a bridge is to be subjected at any one time. The inventory rating is the lower load level and represents the load level which can safely use a bridge for an indefinite period. The National Bridge Inspection Standards require a bridge to be posted when the maximum legal load allowed on the highways in a State exceeds the load permitted under the operating rating. A State, however, may elect to use a lesser load level, as low as the inventory rating, to determine

a safe load capacity. The manual states that all bridges that will not support 3 tons should be closed to all traffic.

Responsibility for posting and closing bridges can vary from one State to another. However, State governments usually are responsible for posting and closing the State-owned and/or controlled bridges, which would include most of the bridges on Federal-aid routes.^{1/} However, local governments usually have responsibility for posting and closing the off-system bridges. A recent survey by FHWA's region 6 Director, Office of Bridge, showed that State government officials were responsible for posting and closing off-system bridges in only 4 of the 35 States surveyed. In the five States we visited, local governments had the responsibility for posting, closing, and enforcing the weight restrictions on their bridges whether Federal-aid or off-system.

In most States the State government apparently does not have the authority to require proper posting and closing of off-system bridges. For example, State government officials in four of the five States we visited did not believe they had that authority. A Tennessee attorney general's opinion issued at our request says that Tennessee State government officials have no legal authority to force local governments to post, close, or enforce weight restrictions for off-system bridges or Federal-aid urban bridges and that they have only indirect authority for enforcing weight restrictions on Federal-aid secondary bridges. These are the bridges owned or controlled by local governments.

Georgia and Pennsylvania transportation department officials told us that they do not have authority over off-system bridges. According to Louisiana Department of Transportation and Development's general counsel, the State government does not have blanket authority to force closure of local bridges but the State could probably win a lawsuit giving them the authority under its general police powers to close a bridge if the State needed to challenge a parish. Illinois transportation department officials said that they believe they do have the authority to post or close off-system bridges but posting and closing of off-system bridges is left to the local governments that own and/or maintain them.

^{1/}Generally, most off-system bridges are locally controlled and most on-system bridges are State controlled. There are instances in which States control and have responsibility for off-system bridges and in which local governments have responsibility for Federal-aid bridges. However, in this chapter we will deal with the usual on-system/off-system situation.

BRIDGES ARE NOT BEING PROMPTLY AND
PROPERLY POSTED AND CLOSED

Although we did not make an extensive field review of bridge postings and closings, our work indicated that problems exist, especially off the Federal-aid system. Some bridges should be closed to all traffic but they remain open, and some bridges should be posted but they are not posted at all or are improperly posted. In some other cases, bridges are unnecessarily posted or restricted to a lower weight limit than necessary.

A recent tabulation by FHWA's Bridge Division based on data from the national bridge inventory showed that there are about 60,000 bridges nationwide that should be posted or closed that are not. A Bridge Division official noted several problems that affect proper posting and closing by State and local government officials. These were:

- Isolation of communities. According to the official, small communities not serviced by major routes have theoretically become completely cut off from delivery of goods, fuel, bus service, and emergency vehicle use because of posted bridges on all routes leading into the communities. The official further stated that, although larger towns and cities may have some routes open to all traffic, a posted bridge has a dramatic effect when emergency vehicles must use "precious minutes" traveling over an alternate route when responding to a call.
- An overall general reluctance to post and close bridges because the bridge's use is lost or limited.
- The continued removal of signs at posted bridges by individuals. These individuals may be opposed to the bridge postings, want the signs for their own use, or are solely engaging in mischief.
- Insufficient funds to install, monitor, and replace signs.
- Liability for damages when a vehicle weighing less than the posted load causes a bridge to fail. Some State and local government officials have expressed concern that they would be liable for damages if a posting sign indicates a bridge will safely support a certain weight and a vehicle weighing less than that weight uses the bridge and it collapses.

We analyzed posting and closing data from the national bridge inventory as of October 1980 for the States we visited. As shown in the following table, the national inventory contained a high percentage of Federal-aid and off-system bridges that are reported as not being posted or closed but should be.

	<u>Bridges that should be posted or closed</u>	<u>Bridges that are closed</u>	<u>Bridges that are not posted or closed</u>	<u>Percent not posted or closed</u>
	<u>posted</u>	<u>(note a)</u>		
Ill.	5,447	1,656	644	3,147
Ga.	4,528	1,089	77	3,362
Pa.	2,197	2,404	117	0
Tenn.	2,523	605	63	1,855
La.	1,810	385	2	1,423

a/At a later date, FHWA field offices, at the request of the Bridge Division, checked the data on closed Federal-aid bridges with the States and these numbers changed slightly. This matter is discussed later in this chapter.

We discussed the above data with several State officials. They generally believed that the posting and closing problem is not as severe as the data indicates, especially on the Federal-aid system. The officials said the data did not accurately reflect postings and closings because of improper coding and lack of current inventory information.

FHWA uses two items in the national bridge inventory to determine if bridges that should be posted are posted or closed. For one item (Item 41), the State and local governments are supposed to classify each bridge as either open, posted, or closed. For the other item--the safe load capacity (Item 70)--they are to evaluate each bridge's safe load in comparison to the State legal load. If posting is required, Item 70 is to be coded as a 4 or less (see list of appraisal ratings in app. II). Item 70 is to be coded as 5 or greater if no posting is required. When coded correctly, a comparison of Item 70 which indicates bridges that should be posted and Item 41 which indicates bridges that are posted (or closed) would show bridges that are not posted but should be.

In Illinois State officials told us that Item 70 is not a good indicator to use to determine if bridges in the State should be posted or closed. They said that bridge inspectors may not be aware of the significance of coding the item 4 or less and are coding it incorrectly. The officials further said that they have recently revised the coding guidelines in an attempt to clarify the coding instructions for the inspectors. The State was also implementing a computerized system so that it will be able to better monitor posting and closing.

Tennessee may also have data problems. For many bridges, Item 70 is not consistent with the calculated load-carrying capacity. State data showed that 2,955 bridges had load capacities that required posting. On the other hand, only 2,492 bridges had Item 70 coded as 4 or less and thus requiring posting. Only 2,409 of these were on the list of 2,955 bridges. An additional

83 bridges were coded 4 or less for Item 70 but their load capacities were greater than required for posting and therefore should not have been coded as requiring posting.

Item 41 for Tennessee bridges may also be inaccurate. State inspectors code each bridge's status at the time of inspection, and the information is normally not updated if the status changes. Thus, a bridge may be posted after an inspection takes place but the posting would not be shown in Item 41 until after the next inspection. The State of Georgia also does not always update Item 41 for changes subsequent to the inspections. Illinois officials told us that only 350 of the 622 bridges reported as closed in the State inventory are actually closed. The officials said some inspectors were mistakenly coding some bridges as closed that are in fact open.

The problem of unreliable data may be more widespread than in the above States. For example, FHWA's Bridge Division questioned the national inventory data on closed bridges and had FHWA field offices report (for the purpose of its annual bridge report to the Congress) the number of Federal-aid bridges that were closed. The field offices reported 325 closed Federal-aid bridges rather than the 588 in the national inventory.

No one knows how many bridges are posted and closed nationwide and how many should be but are not. Nonetheless, our review shows that bridges are not always being properly and promptly posted and closed.

In Tennessee, we visited several bridges that were recommended for closure but had not been closed. Furthermore, several local government officials told us that they had responsibility for several bridges recommended for closure but the bridges were still open. These officials said that they did not intend to close these bridges, primarily because of pressure from their constituents. Tennessee State officials told us that some local governments had also repaired some bridges recommended for closure and kept the bridges open but the repairs had not been inspected by the State to determine whether they were adequate.

Our review of Tennessee posting data also showed that some bridges were posted when they should not have been and some were posted for too low a weight limit. At the end of our review, State officials were notifying their regional offices of the discrepancies for further investigation and corrective action.

According to the State of Georgia's inventory data, 246 bridges had been recommended for closing but only 57 were actually closed. Our review of the State bridge files showed that all the State-controlled bridges had been closed but less than 25 percent of the county bridges--Federal-aid and off-system--had been closed as recommended. In addition, our review of a limited number of bridge files showed that bridges that were closed were not always closed promptly. For example, two out of

eight bridges took over 2 years to close after the recommendation to close had been made. Only one bridge was closed promptly, and the other five closings ranged from 1 month to 19 months.

The FHWA Division Office in Georgia noted that its field checks found posting of off-system bridges to be "spotty." Many bridges were posted, but many were not.

We presented the above data to Georgia State transportation officials who notified local officials by letter that the bridges should be closed. At the end of our review, State officials were beginning to receive feedback from county officials on some of the bridges. According to State officials, some of the bridges were still open, some had been repaired, and some were closed but the State was not notified.

The State transportation department had performed the initial off-system inspection for the local governments but because of funding problems did not plan to perform the required re-inspections. The local governments also were not doing the inspections because of insufficient funds and qualified personnel. However, transportation officials have decided to begin the re-inspections immediately due to the concern over proper closing of local bridges.

Some Pennsylvania bridges are posted when not necessary. For example, a local township manager told us that all bridges owned by the township--whether structurally deficient or sound--are posted for 10 tons or less. According to the manager, the purpose of this practice is to keep trucks out and maintain the community's tranquility. The State's inventory data indicates that the practice may be widespread in the State. Over 300 more bridges are posted or closed than should be.

The practice of unnecessary posting does not present the same safety problem as not posting. Nonetheless, it does restrict the highways' use unnecessarily, and we believe it could raise doubts in the minds of highway users about posting accuracy and the need to comply with posted limits.

FHWA's annual maintenance reviews have revealed posting and closing problems in other States. Following are several examples of these problems as reported by FHWA division officials:

--The calendar year 1980 annual maintenance report for New York, dated February 9, 1981, states that the New York State Department of Transportation has no legal authority with regard to local bridge posting and that local officials have been notified of their legal authority and responsibility and advised to obtain the services of a qualified professional engineer to determine whether or at what safe capacity loads bridges should be posted. The report also noted that many bridges on the State highway system had a very low load rating but were not posted.

The report considered this "an item requiring major effort to correct."

--The 1980 annual maintenance report for Vermont, dated December 29, 1980, noted that "some towns do not post bridges and the State cannot require them to do so."

--The 1980 maintenance report for New Mexico stated that the State has taken steps to simplify posting procedures and is furnishing load-limit signs to local governments at no cost. According to the report, these actions have helped; however, the real problem appears to be the county officials' "lack of interest and/or understanding" of the overall inspection program and their responsibility under the National Bridge Inspection Standards.

Some State and local governments have not calculated safe load capacities for all their bridges. For example, Louisiana had not prepared load ratings for 33 percent of its Federal-aid and State-system bridges. Louisiana officials were rating the worse bridges first, and the majority of the bridges not rated were built after 1960. According to FHWA and Louisiana State officials, the ratings for all bridges have not been calculated because the bridge rating unit is understaffed. Louisiana follows more meticulous rating procedures than many States do. For example, the bridge rating unit sends out an engineer in the unit to inspect and evaluate bridges whenever routine inspection reports show that a major bridge component is in poor condition. According to Louisiana officials, the State could use less time-consuming procedures but believes the detailed calculations are worthwhile.

Idaho also had not calculated the load ratings for many of its bridges. As of October 1980, load ratings had not been calculated for 70 percent of Federal-aid bridges and 15 percent of off-system bridges. According to FHWA, the inspection program "has been underway for about 10 years so it is reasonable to think the analysis work should be done." FHWA officials have stressed to State officials that "it is imperative the State take action to get the load analysis work done." According to FHWA, the problem stems from a lack of staff.

BRIDGE POSTINGS AND CLOSINGS ARE OFTEN IGNORED, AND ENFORCEMENT IS LIMITED

Even when bridges are posted or closed, the postings and closings are often disregarded and enforcement is insufficient or lacking. Citizens and businesses often continue to use a bridge even though they know they exceed its posted criteria; penalties for violations are often low; and enforcement manpower is limited.

Officials in all the States we visited told us that violations of posting and closing of bridges are occurring in their States. There is particular concern about schoolbuses violating bridge limits. In Louisiana a parish official said that an insurance carrier threatened to cancel the insurance on his parish's schoolbuses because they were crossing posted bridges. In Illinois a county official told us that he had to send registered letters to school principals explaining the postings of some of his bridges to get them to comply with the posted weight limits with their schoolbuses. Even then he said that the school officials attempted to get the State to raise the limits. The following photograph shows a schoolbus--schoolbuses weigh around 10 tons--crossing a bridge posted for 6 tons.



According to a newspaper report, angry residents near Nashville, Tennessee, have twice removed steel barricades erected to block access to a closed bridge and have continued to use it. The second time they also removed a load of large rocks which had been dumped on the bridge in an effort to close it. State and local officials said anything short of dismantling a bridge will not ensure that a closed bridge is not used. One Louisiana parish tore out seven bridges because local people kept crossing them after the parish closed them.

State and local officials told us that vandalism involving the removal or defacing of postings at bridge sites is also an expensive problem in trying to ensure that bridges are properly posted or closed. FHWA has also cited the continued removal of signs at posted bridges as a problem. Such actions can endanger the lives of those who unknowingly may attempt to cross a bridge with loads that the bridge will not support.

The difficulty of enforcing the posting and closing of bridges is increased because of the very low penalties in some States. According to Louisiana State enforcement officials, fines for violating the State's vehicle weight and size regulations were assessed as high as \$1,500 in early 1978 when the State initiated enforcement. These officials said the fines have since been reduced to a high of \$120 because of industry pressure. The average fine is now \$100 with no additional penalties for repeat offenders. On Louisiana's local roads, when a person is caught violating a parish weight limit ordinance, the maximum fine the police jury can levy is limited to \$100 regardless of what the offense is, according to one parish official. The Louisiana Police Jury Association is trying to have the law changed to increase the fines.

A Tennessee enforcement official said the situation is similar there. He said that the penalty for an overweight truck in Tennessee is only a \$50 fine and that the case is often dismissed without punishment. He said that this penalty is so small that many haulers would just as soon continue to take their chances and pay the relatively small fine, if caught.

In a July 1979 report 1/ to the Congress concerning excessive truck weight on highways and bridges, we pointed out that our review of shipping records in 10 States showed numerous instances of routine overweight truck shipments. We also reported that:

--State agencies enforced weight laws on only 40 percent of the Nation's highways.

1/ "Excessive Truck Weight: An Expensive Burden We Can No Longer Support," CED-79-94, July 16, 1979.

- There was little weight enforcement in urban areas.
- Many States devoted only minimal resources to weight enforcement.
- Most fines for overweight violations were too low to be effective deterrents.
- Many States did not have effective enforcement provisions.
- Most permanent weighing scales used by enforcement officials to check for overweight trucks were ineffective because they were easily avoided.

An Illinois State Police official said monitoring posted and closed bridges is a very minor part of law enforcement responsibilities and very few violations are detected. In Tennessee the State has responsibility for enforcing weight limits on the State routes and Interstates. A weight enforcement official estimated that enforcement officers probably spend less than one-tenth of 1 percent of their time enforcing weight limits on bridges, and he estimated there is also little enforcement effort for bridges on off-system routes.

Parish officials in Louisiana told us that some parishes have neither the funds nor the personnel to enforce the posting or closing of bridges on their local roads and they have received little or no assistance from the State enforcement agencies. One parish sent a resolution to the Governor asking for assistance in enforcing posted limitations. The resolution was passed to State enforcement agency officials, who told the parish they could help only to the extent of training parish personnel to do the job. Another parish appealed to the Louisiana State Police for enforcement assistance and was told this matter was a parish responsibility and out of its jurisdiction.

CONCLUSIONS

The primary purpose of the National Bridge Inspection Standards is to ensure that unsafe bridges are identified and appropriate actions are taken to protect the public against them. A key safety feature of the standards is the requirement that bridges be rated for their safe load-carrying capacity and that structurally weak or inadequate bridges be properly posted or closed. Under the standards, the owner or the agency that maintains the bridge is responsible for proper posting and closing. State government agencies are generally responsible for State-owned or -controlled bridges, and local governments are responsible for the others. Although it can vary by State, State government agencies, for the most part, are responsible for Federal-aid bridges and local governments are responsible for off-system bridges. In most States it appears that State governments do

not have any authority over posting and closing of local government bridges.

The States and local governments are not fully complying with the National Bridge Inspection Standards, especially for off-system bridges. Some bridges that are unsafe and should be closed have not been closed. Some others have been closed, but they were not closed promptly--some closings took place up to 2 years after closing was recommended. Furthermore, some bridges that should be posted apparently have not been posted at all, and some bridges are posted but not for the proper weight limit. The major cause appears to be the inconvenience and economic impact of posted and closed bridges and the resulting public pressure to keep bridges open and unrestricted.

National and State bridge inventory data is not adequate to properly monitor bridge posting and closing. The States apparently are miscoding Item 70--safe load capacity--which would indicate whether a bridge should be posted. Furthermore, Item 41 which indicates whether a bridge is posted, closed, or open, is often not updated for changes in posting or closing status until after the next inspection.

Even if bridges are properly posted and closed, motorists often ignore the posting and closing. FHWA and State officials told us that vandalism of posting signs is a problem and bridges often have to be dismantled to keep people from using them. Motorists apparently do not clearly understand the danger of exceeding posted weight limitations or continuing to use closed bridges.

State and local government enforcement of bridge weight limits is inadequate. The number of posted and closed bridges is large, and enforcement funds and staff are insufficient. When violators are caught, the penalties are often too low to serve as an effective deterrent.

RECOMMENDATIONS

In chapter 5 we recommend that the Secretary of Transportation direct the FHWA Administrator to assess the States' and local governments' compliance with the National Bridge Inspection Standards and develop a strategy for bringing about full compliance. This effort should also include bridge posting and closing. The Administrator should specifically consider encouraging the States to (1) give State government agencies the authority for posting and closing of local government bridges, (2) increase weight limit enforcement efforts, (3) increase penalties for violating weight limits and vandalizing posting signs, and (4) establish public information programs to inform the public about the danger of violating bridge weight limitations and removing posting signs.

We also recommend that the Secretary of Transportation direct the FHWA Administrator to take appropriate actions to ensure that national bridge inventory data is accurate and adequate so that FHWA can properly monitor bridge posting and closing.

FHWA COMMENTS AND OUR EVALUATION

FHWA officials did not address our overall recommendation that the Secretary of Transportation direct the FHWA Administrator to include bridge posting and closing in his assessment of State and local government compliance with the National Bridge Inspection Standards. However, the officials commented on the four items that we recommended that the Administrator consider in his assessment.

FHWA officials said that giving State governments the authority for posting and closing local government bridges is a State matter that must be worked out at the State level, and it is not a proper Federal role to encourage States to usurp powers from local governments. According to the officials, if a particular State is having a problem with local officials, changes in the State laws or constitution may be appropriate but the changes should be initiated in the State legislatures. The officials stated that FHWA will continue to administer the program through the State highway agencies and encourage them to assume a leading role in load posting and weight limit matters.

As we discussed in this chapter, structurally deficient bridges are not always being properly posted and closed, especially off the Federal-aid system, and public safety may be threatened. We recognize that bridge postings and closings are a State and local responsibility, but we believe that FHWA has a major role to play in ensuring that Federal requirements regarding posting and closing are met. If local governments cannot properly post and close bridges because of local public pressure or inadequate resources, State governments may have to assume the authority. FHWA can assist by helping to identify these cases and bringing them to the attention of the proper State authorities. It may need to encourage these authorities to initiate action to give the State government the authority for posting and closing.

FHWA officials said weight limit enforcement efforts and penalties for violating weight limits were addressed in the 1978 Surface Transportation Assistance Act. According to the officials, each State Governor must certify annually that the State is enforcing State weight limit laws and document the resources and enforcement problems encountered. The officials said that FHWA will continue to use this requirement to encourage active weight limit enforcement at the State level.

The 1978 Surface Transportation Assistance Act requires each State to certify annually that it is enforcing all State laws regarding maximum vehicle size and weights permitted on

the Federal-aid system. In this chapter, we are discussing bridges that will not support the legal vehicle weight and must be closed or posted. If State weight enforcement efforts are sufficient to enforce maximum vehicle weight laws, it does not necessarily follow that postings and closings are enforced. Furthermore, as pointed out in chapter 2, most of the posted and closed bridges are off the Federal-aid system.

FHWA officials said that public information programs to inform the public about the danger of violating bridge weight limitations and removing posting signs will be evaluated for cost-effectiveness by FHWA; however, these programs are usually most effective when formulated and carried out at a State or local level. We recommend that FHWA consider encouraging the States to establish public information programs. An alternative would be for FHWA to develop a national program if it would be more effective and more economical.

FHWA officials commented that FHWA will continue to stress accuracy and completeness of national bridge inventory data to assure reasonably accurate monitoring of bridge load postings and closings. According to the officials, this will be done through management reviews and an emphasis on the need for improved accuracy and completeness of data. During our review we found that the accuracy of national bridge inventory data on postings and closings is highly questionable and is not adequate for monitoring proper posting and closing. FHWA needs to do more to ensure that the data is adequate.

CHAPTER 7

FEDERAL AGENCIES THAT OWN BRIDGES SHOULD COMPLY WITH THE NATIONAL BRIDGE INSPECTION STANDARDS

Federal agencies are not required to follow the National Bridge Inspection Standards or to include their bridges in the national bridge inventory unless the bridges are on the Federal-aid system or are off-system highway bridges on public roads.^{1/} As a result, the standards do not apply to most federally owned bridges and these bridges are not in the national inventory. There are almost 14,000 bridges owned by Federal agencies such as the Forest Service, National Park Service, and the Bureau of Land Management.

The Federal agencies we contacted all had inspection programs, but they were not always complying with their own regulations and some of the programs did not conform to the national standards. We believe that Federal agencies that own bridges should comply with the national inspection standards and the bridges should be in the national inventory for monitoring by FHWA. The National Bridge Inspection Standards were established to provide for the proper safety inspection of State and local bridges. The public is justified in expecting the same degree of safety when traveling on federally owned bridges.

Federal agency bridges do not qualify for funding under the Highway Bridge Replacement and Rehabilitation Program. Each agency's budget has provisions for its bridge inspection program and the related repair and construction costs.

NUMBER AND CONDITION OF FEDERAL AGENCY BRIDGES

Federal agencies own an estimated 13,800 bridges. Over 70 percent of these bridges belong to the Forest Service. The following table gives the number of bridges by Federal agency.

^{1/}With regard to the National Bridge Inspection Standards, a public road is any road or street under the jurisdiction of and maintained by a public authority and open to the public. A public authority is defined as a State; county, town, or township; Indian tribe; municipal or other local government or instrumentality with authority to finance, build, operate, or maintain toll-free highways. A Federal agency apparently is not considered such a public authority.

Bridges Owned by Federal Agencies (note a)

<u>Federal agency</u>	<u>Number of bridges</u>
Corps of Engineers	300
Bureau of Reclamation	370
Bureau of Land Management	1,000
Tennessee Valley Authority	114
Bureau of Indian Affairs	780
National Park Service	1,218
Forest Service	<u>10,000</u>
Total	<u>13,782</u>

a/Some other Federal agencies may own a very small number of bridges.

Less than 1 percent of these bridges are trail bridges; the remainder are road bridges. About 10,600 of these bridges meet FHWA's bridge program criteria of being 20 feet or more in length. Federal agencies in total own more bridges than many States.

Most Federal agency officials believe their bridges are generally in good condition. They told us that very few bridges are closed to traffic but many are posted for limited weights. However, as discussed below, some bridges are in poor condition.

We have previously criticized Federal agencies for public use of substandard bridges. In a report to the Congress entitled "Facilities in Many National Parks and Forests Do Not Meet Health and Safety Standards" (CED-80-115, Oct. 10, 1980), we noted that substandard bridges were being used by the public in national forests and national parks. For example, FHWA inspection data 1/ for one national park showed that 11 of 19 bridges in that park did not meet FHWA bridge standards and were structurally deficient.

In addition to our work on that report, we talked with agency officials and reviewed bridge data from the Bureau of Indian Affairs, the National Park Service, and the Forest Service to determine the condition of their bridges. The agencies use numerical condition and appraisal ratings to rate bridge components.

A review of the latest available inventory data for 76 Bureau of Indian Affairs bridges identified major structural and/or functional obsolescence problems for 9 of these bridges. An additional 24 bridges had safe load capacities that met only

1/The National Park Service contracted with FHWA to inspect its bridges.

minimum tolerable limits to be left in place as is. Under FHWA's criteria, these bridges should be posted for lower weight limits.

The following table shows the priority of improvement (with A the highest priority and D the lowest) and the condition of 1,127 National Park Service bridges as of April 27, 1981. According to National Park Service inventory data, over 5 percent of the bridges were in danger of collapse and should be closed.

Condition of National Park Service Bridges

<u>Priority of improvement</u>	<u>Condition of bridge</u>	<u>Number of bridges</u>
D	Structurally sound, can carry legal loads, may or may not require preventive maintenance	480
C	Structurally sound, can carry legal loads but is functionally obsolete or requires a high degree of maintenance to remain open	427
B	Less critically deficient, can remain in service at reduced loads with frequent inspections	161
A	Most critically deficient and requires replacement as soon as possible	<u>59</u>
	Total	<u>1,127</u>

According to a National Park Service official, the most critically deficient bridges (59) have either been closed or posted for weight restrictions, depending on the severity of their condition. Those bridges with weight restrictions only (not closed) warrant replacement due to structural inadequacies which are coupled with high traffic volume and vital importance to the community. An estimated \$54 million would improve existing National Park Service structures to the standards for which they were originally built. Also, FHWA personnel have identified a need for an additional \$31 million to replace or reconstruct 48 of these bridges to today's bridge standards.

A summary report of all Forest Service bridges was not available at the time of our review because the Forest Service was in the process of incorporating a new computer system for its bridge program. We therefore reviewed data for its region 3 and region 9. As discussed below, bridge data showed that some bridges were in bad condition; however, regional office officials did not believe the data accurately reflected overall bridge conditions.

A region 3 bridge report dated August 14, 1979, showed that 17 percent of the road bridges in region 3 were not adequate for legal loads or required high repair priority. A Forest Service official for this region believes that half of these bridges require only minor repairs to correct the weight restrictions and deficiencies. He also said that the remaining bridges in this category requiring high repair priority are essentially functionally obsolete bridges which are unable to keep pace with current traffic flow. This same official feels that different interpretations of inspection criteria by the bridge inspectors have led to an overstatement of the region's bridge problem. Also, he feels that adequate funding for immediate repair and maintenance needs has been available but funding for the functionally obsolete bridges is difficult to obtain, since structural deficiencies receive priority for replacement and rehabilitation funds.

A sample of 98 bridges in region 9 as of August 18, 1980, showed that bridge components for about 27 percent of the bridges needed major repair or replacement. However, according to a region 9 Forest Service official, the true condition for several of these bridges is not accurately reflected in this report because of the lack of adequate data used to develop the report. This same official said that the majority of the bridges that need repair or replacement, are posted for reduced load-carrying capacity while awaiting maintenance and repairs. Those bridges with severe deficiencies are closed and traffic is rerouted until replacement or rehabilitation is complete.

FEDERAL AGENCY BRIDGE INSPECTION PROGRAMS

Federal agencies are not required to comply with the National Bridge Inspection Standards. However, each of the agencies we contacted had an inventory and inspection program. Of the seven Federal agencies in our review, all but two agencies had a 2-year inspection requirement for all bridges, similar to the national standards. The Bureau of Reclamation's policy was to inspect Federal-aid system bridges every 2 years; however, other Bureau bridges were inspected every 2 to 3 years. The remaining agency, the National Park Service, initially contracted with FHWA to inspect its bridges every 4 years. The National Park Service recently revised its agreement with FHWA to inspect every 3 years or more frequently if necessary. In addition to the 2-year inspection requirement, the Tennessee Valley Authority has a 5-year indepth inspection requirement which includes surveying calculations and the Bureau of Land Management has a 5-year indepth inspection requirement which involves a general check on the bridge inspection process.

Five agencies use agency personnel and/or consultants to perform inspections, while two contract with FHWA and/or use agency personnel. As stated earlier, FHWA inspects for the National Park Service. The Bureau of Land Management uses its own inspectors with the exception of the use of FHWA inspectors in

Oregon. An FHWA official believes that FHWA would be willing to provide inspection services for all Federal agencies but FHWA currently does not have the resources.

According to various agency officials, the inspectors for the agencies' bridge programs are qualified for their position and meet the qualifications required by the standards. All the agencies used structural inventory and appraisal sheets similar to those used by the States and apply numerical condition ratings from 0 to 9 to evaluate components of a bridge's condition.

Of the seven agencies, only the Bureau of Land Management indicated that its initial inventory and inspection was not complete. The National Park Service was just completing its first round of inspections which had begun in 1976.

Indications are that some Federal agencies are not complying with their bridge inspection schedule. Our sample data (76 bridges) for the Bureau of Indian Affairs showed that about one-third of the bridges were from 1 to 10 months overdue for inspections. Of the 98 bridges in our region 9 Forest Service sample, 32 bridges were apparently overdue for inspections. Sixteen of the bridges were from 1 month late to 51 months late. For the other 16 bridges, we could not determine how late the inspections were from the Forest Service computerized inventory system. According to engineering officials from 3 of region 9's 14 forests, the inspections are behind schedule approximately 1 year. These officials told us that other staff responsibilities receive priority over bridge inspection, causing delays in the 2-year cycle for inspections. Therefore, input for the computer reports is also delayed and the regional office is unable to provide complete and accurate inventory information. We noted only one reference to lack of inspection of federally owned bridges in FHWA's 1980 annual maintenance reports. In Delaware four bridges owned by the Corps of Engineers had not been inspected in 4 years.

THE NATIONAL BRIDGE INVENTORY AND FEDERAL AGENCY BRIDGES

Because each State department of transportation is responsible for submitting its bridge data to the national bridge inventory, some States have also assumed responsibility for including federally owned or maintained bridges in the inventory. These States have requested and some are obtaining bridge data from Federal agencies. According to regional FHWA and Illinois Department of Transportation officials, bridges in the State that are owned by Federal agencies are included in the inventory. Also, FHWA's fiscal year 1980 annual maintenance report for Alaska stated that the Forest Service and the National Park Service bridges are inspected and included in the State's records but not counted for record purposes.

We noted that other States had requested inspection data from Federal agencies but were having problems getting it for

all bridges. Tennessee State officials requested bridge data from the Tennessee Valley Authority, the National Park Service, the Forest Service, the Corps of Engineers, and the Department of Energy. The Forest Service was in the process of inspecting its bridges in Tennessee in accordance with the State's off-system bridge inspection procedures. Reports of completed inspections were provided to the State, but the inspections for all Forest Service bridges in the State were not scheduled to be completed until September 1981, about 9 months after Tennessee was required by the National Bridge Inspection Standards to have its off-system bridges inspected. The National Park Service, the Tennessee Valley Authority, and the Corps of Engineers were not routinely providing Tennessee with updated inspection data on the bridges in the State. In addition, even though FHWA inspects bridges for the National Park Service, the bridge data Tennessee received for the National Park Service had different structure numbers and was presented in a different format than the format used by the State. Because of a recent computer conversion, bridge reports following the States' standard format can now be produced by the National Park Service's computer system. FHWA's fiscal year 1980 maintenance report for Florida stated that attempts have been made to obtain inspection reports on bridges owned or maintained by Federal agencies but these attempts have been unsuccessful.

As of October 31, 1980, national bridge inventory data contained about 1,400 of the bridges owned or maintained by Federal agencies. Some Federal agency bridge inventory and inspection data was being submitted to FHWA headquarters, but not for the purpose of including it in the national bridge inventory. Currently, the Bureau of Indian Affairs, the National Park Service, and the Forest Service submit bridge data to FHWA's Office of the Direct Federal Program Administrator for assistance in planning, programming, designing, and supervising road and bridge projects for their agency. FHWA agrees that, although not required by legislation, including Federal agency highway bridges in the national bridge inventory would be desirable to provide a complete file of all bridges in the country.

CONCLUSIONS

Federal agencies have a substantial number of bridges used by private concerns as well as the general public. Some of these bridges are in bad condition. Agencies have inspection programs, but they are not fully complying with their own requirements. Furthermore, the agencies' programs do not fully conform to standards that State and local governments are required to meet by Federal law. The traveling public should be able to expect that the bridges they encounter in national parks and other Federal lands are inspected and monitored in accordance with the same standards as bridges on public roads.

RECOMMENDATION

We recommend that the Congress require Federal agencies that own bridges to comply with the National Bridge Inspection Standards and report bridge data to the national bridge inventory for monitoring by FHWA.

FHWA COMMENTS AND OUR EVALUATION

FHWA officials said that FHWA has no objection to the Congress' requiring Federal agencies to report bridge data to the national bridge inventory but that FHWA currently lacks authority and staff to monitor bridge inspections, appraisal, and load posting activities of other Federal agencies. The officials also said that Federal agency bridge data should be transmitted to the national bridge inventory through the State highway agencies.

We believe that the traveling public is justified in expecting that the bridges it crosses on Federal lands are inspected and monitored according to the same standards as State and local bridges. If the Congress decides to require Federal agencies to comply with the National Bridge Inspection Standards, Federal agencies would submit data to the States for their inventories and transmittal to the national inventory as other bridge owners are required to do. FHWA monitoring of State and local bridges should include Federal agency bridges and use existing resources to the extent possible.

APPENDIX I

JIM SASSER
TENNESSEE

APPENDIX I

COMMITTEES:
APPROPRIATIONS
BUDGET
GOVERNMENTAL AFFAIRS

United States Senate

WASHINGTON, D.C. 20510

April 4, 1980

Honorable Elmer Staats
Comptroller General of the
United States
General Accounting Office
441 G Street, N. W.
Washington, D. C. 20548

Dear Mr. Comptroller General:

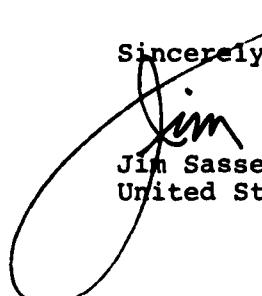
I have just completed a thorough review of the bridge situation in my own State of Tennessee, and I am dismayed by the inadequate reporting and apparent inequities of the present bridge inspection program.

The inspection system currently in use often fails to identify those bridges that are in a state of imminent collapse. For example, a bridge in the Memphis area collapsed three weeks ago, killing one and seriously injuring two others. The bridge had a 59.0 sufficiency rating on a scale of zero to 100, according to the Federal Highway Administration.

I would respectfully request that the General Accounting Office conduct a review of the inspection system used for bridges both on and off the federal-aid highway system. I am especially interested in ensuring that sufficiency ratings given the nation's bridges adequately reflect their true structural and safety condition. Consequently, recommendations on the viable alternatives to the present inspection system would be appreciated.

Thank you for your assistance in this matter. Mike Walls and Wally Dietz are my staff contacts on this matter, and may be reached at 224-3344. I look forward to hearing from you in the near future.

Sincerely,


Jim Sasser
United States Senator

APPENDIX I

JIM SASSER
TENNESSEE

APPENDIX I

COMMITTEE:
APPROPRIATIONS
BUDGET
GOVERNMENTAL AFFAIRS

United States Senate

WASHINGTON, D.C. 20510

April 16, 1980

Honorable Elmer Staats
Comptroller General of the
United States
General Accounting Office
441 G Street, N. W.
Washington, D. C. 20548

Dear Mr. Comptroller General:

On April 4, I requested the General Accounting Office to conduct a review of the inspection system used for bridges on and off the federal aid highway system. As you may recall from my letter of that date, the impetus for the request was a bridge failure in Memphis last month in which one person was killed and two others injured. On Friday, April 11, I personally toured several bridges in Memphis with representatives of the U. S. Army Corps of Engineers, the Federal Highway Administration and the City of Memphis.

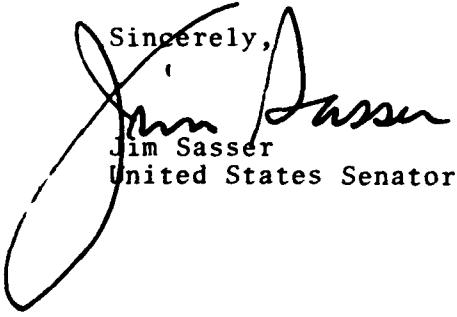
As a result of several observations from the tour, I would respectfully like to ask that the GAO review include investigations into these specific areas:

1. A determination of how well bridge inspection ratings reflect the actual structural soundness of the bridges.
2. An evaluation of the criteria utilized by the Federal Highway Administration in the rating system to determine if other factors, such as erosion of streambeds, should be given greater weight in the ratings.
3. A determination of whether there can be, and how better cooperation between federal, state and local authorities who inspect and maintain bridges can be established.
4. A determination of whether there is an inequitable distribution of federal bridge replacement funds, either through inadequacies in the system used to place priorities on certain projects, or through the reported instances by some inspecting authorities to "low-rate" bridges in order to be eligible for a greater amount of funding.

Comptroller General Elmer Staats
April 16, 1980
Page Two

I believe answers to these items are essential if we are to come to grips with a problem which is now plaguing not only Memphis, but several other areas of Tennessee and other states. In my tour of the Memphis bridges, I found that Memphis has some problems inherent with its sandy, easily erodible soil and streambed degradation caused by erosion and commercial development. But as I reported earlier, the bridge which collapsed had received a rating of "59" on a scale of 0-100 and was not eligible for replacement funds. And on the same day of heavy rains in Memphis, another bridge, maintained by the state and rated "49.9" in its last inspection, was closed because of a shifting of its pile bents. That bridge was eligible for replacement funds, but had not received a high priority for repair. My main concerns are to see to it that structurally deficient bridges are closed or repaired, or that weight limits or other lesser measures are imposed. And I want to see if there is substance to fairly persistent rumors that some states have been "low-rating" bridges to qualify for more funding.

Thank you for your assistance in this matter. I look forward to hearing from you in the near future.

Sincerely,

Jim Sasser
United States Senator

APPENDIX II

APPENDIX II

FHWA's Definition of a Deficient Bridge

A bridge is:

Structurally deficient if it has	Functionally obsolete if it has
A condition rating of 4 or less for its --Deck, or --Superstructure, or --Substructure, or --Culvert and retaining walls.	An appraisal rating of 3 or less for its --Deck geometry, or --Underclearances, or --Approach roadway align- ment.
Or an appraisal rating of 2 or less for its --Structural condition, or --Waterway adequacy.	Or an appraisal rating of 3 for its --Structural condition, or --Waterway adequacy.

Condition rating codes

- N Not applicable.
- 9 New condition.
- 8 Good condition--no repairs needed.
- 7 Generally good condition--potential exists for minor main-
tenance.
- 6 Fair condition--potential exists for major maintenance.
- 5 Generally fair condition--potential exists for minor re-
habilitation.
- 4 Marginal condition--potential exists for major rehabilitation.
- 3 Poor condition--repair or rehabilitation required immediately.
- 2 Critical condition--the need for repair or rehabilitation is
urgent. Facility should be closed until the indicated repair
is complete.
- 1 Critical condition--facility is closed. Study should deter-
mine the feasibility for repair.
- 0 Critical condition--facility is closed and is beyond repair.

Appraisal rating codes

- N Not applicable.
- 9 Conditions superior to present desirable criteria.
- 8 Conditions equal to present desirable criteria.
- 7 Condition better than present minimum criteria.
- 6 Condition equal to present minimum criteria.
- 5 Condition somewhat better than minimum adequacy to tolerate
being left in place as is.
- 4 Condition meeting minimum tolerable limits to be left in
place as is.
- 3 Basically intolerable condition requiring high priority of
repair.
- 2 Basically intolerable condition requiring high priority of
replacement.
- 1 Immediate repair necessary to put back in service.
- 0 Immediate replacement necessary to put back in service.

FHWA's Definition of a Deficient Bridge (continued)Glossary of Terms

Appraisal ratings - These ratings are used to evaluate a bridge in relation to the highway it is on. Each deficiency is evaluated as to how it affects the bridge as a unit, and then the bridge is compared to a new one built to the State's current standards for that particular type of highway.

Condition ratings - These ratings denote the physical condition of the various bridge components.

Deck - The portion of a bridge which provides direct support for vehicular (and pedestrian) traffic. The deck normally distributes traffic loads to the superstructure but may be the main supporting element for some types of bridges. The deck is actually a part of the superstructure but is distinguished for the purpose of bridge inspection and ratings. The deck rating usually should not influence the superstructure rating.

Superstructure - The entire portion of a bridge structure which primarily receives and supports traffic loads and in turn transfers the resulting reactions to the bridge substructure. The superstructure is the upper construction or span(s) of a bridge and may consist of beam, girder, truss, trestle, or other type or types of construction.

Substructure - The abutments, piers, or other construction made of stone, concrete, brick, or timber, built to support the span or spans of a bridge superstructure. Abutments, for example, support the end of a single span or the extreme ends of a multispan bridge and retain or support the approach embankment. Piers provide support at intermediate points between abutments.

Culvert and retaining walls - This item is to be used solely for culverts and refers to alignment, settlement problems, retaining wall (a wall holding back a mass of earth) stability, and structural integrity of culverts.

Structural condition - A bridge's overall structural condition, taking into account the major structural deficiencies relating to the deck, superstructure, substructure, and the load-carrying capacity.

Waterway adequacy - This item refers to the adequacy of the available width for the passage of a stream or other water beneath a bridge and related stream problems, such as scour erosion (the removal and carrying away of soil from the bed and banks of streams, rivers, etc., as a result of the erosive action of running water), that can affect the stability of bridges.

Deck geometry - Primarily the width of the bridge deck in relation to the width of the roadway the bridge is on. If the bridge deck is narrower than the approach roadway, the deck geometry generally would be inadequate and the bridge would be functionally obsolete.

Underclearance - The adequacy of the vertical and horizontal clearances or unobstructed space under a bridge for the free passage of vehicular traffic. This item is used only when a bridge is over a highway or railroad track.

Approach roadway alignment - The adequacy of a bridge's alignment with the roadway approach to it. This item identifies those bridges that can no longer safely service today's traffic because of the alignment of the approaches.

APPENDIX III

APENDIX III

SUFFICIENCY RATINGS GIVEN 10 BRIDGES BY STATEINSPECTION OFFICIALS IN THE SAME STATEAND IN DIFFERENT STATES

<u>Bridge number</u>	<u>Ga.</u>	<u>Ill.</u>	<u>Pa.</u>	<u>Tenn.</u>
30-2378-0.63	0.0 or 2	13.4	3.8	0.0
30-705-0.63		13.4		
47-33-3.88	0.0 or 2	13.4 21.4	4.0	5.6
78-2421-12.537	71.6	60.6	65.0	75.6
78-687-11.255		50.4		
82-3902-2.50	58.2	50.9 38.9	15.2	40.4
62-1200-1.19	64.2	72.8 55.4	73.7	83.5
46-A248-0.58	86.6	93.0 94.0	97.0	95.0
13-A281-0.89	24.1	31.3 24.1	24.5	29.1
15-A448-2.41	13.6	13.6 13.6	17.0	13.6
76-A185-0.04	23.3	55.0 50.0	67.5	74.7
90-A970-0.03	19.6	59.0 44.0	19.5	49.1

APPENDIX IV

APPENDIX IV

CLASSIFICATION OF BRIDGE STRUCTURE BASED ON
RATINGS ASSIGNED BY STATE INSPECTION OFFICIALS AND
FHWA's DEFINITION OF A DEFICIENT BRIDGE

<u>Bridge number</u>	<u>Ga.</u>	<u>Ill.</u>	<u>Pa.</u>	<u>Tenn.</u>
30-2378-0.63	SD	SD	SD	SD
30-705-0.63		SD		
47-33-3.88	SD	SD SD	SD	SD
78-2421-12.537	FO	ND FO	FO	FO
82-3902-2.50	FO	ND FO	FO	SD
62-1200-1.19	FO	ND SD	ND	FO
46-A248-0.58	ND	ND ND	ND	ND
13-A281-0.89	SD	ND SD	SD	SD
15-A448-2.41	SD	SD SD	SD	SD
76-A185-0.04	SD	FO SD	ND	FO
90-A970-0.03	SD	SD SD	SD	SD

SD - Structurally deficient

FO - Functionally obsolete

ND - Not deficient

(342736)

